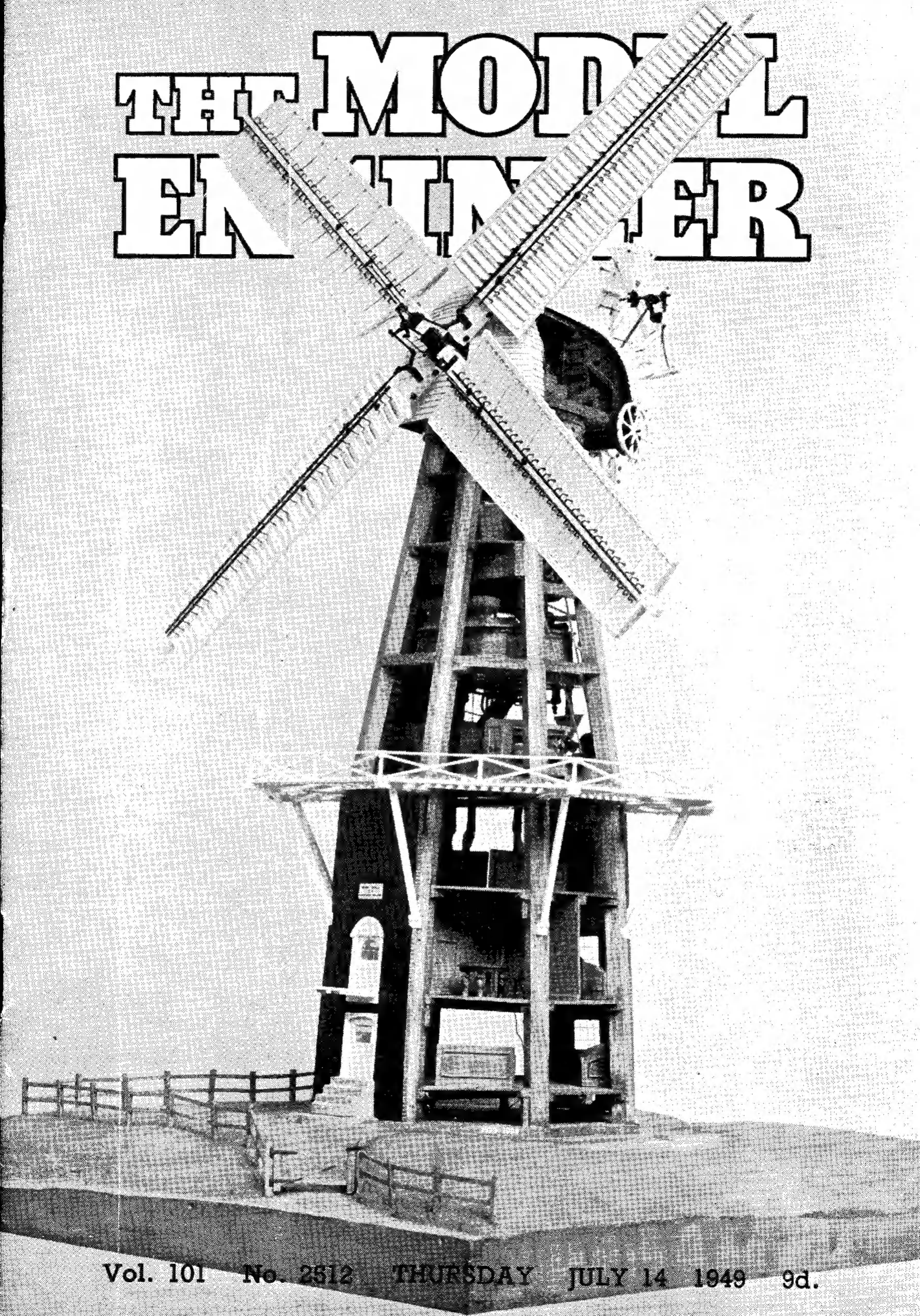
THE MODEL ENGINEER



Vol. 101 No. 2512 THURSDAY JULY 14 1949 9d.

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

14TH JULY 1949

VOL. 101 NO. 2512

Smoke Rings	33	*Ramsgate's Second Exhibition*	54
Utility Steam Engines	35	*In the Workshop*	55
The Nottingham S.M.E. Exhibition	40	*Gear-cutting in the Lathe*	55
A Vision of the Future	42	*The Barker Lathe*	60
Safety First Spring Winding	46	*The Bournville Regatta*	61
A Locomotive Carrying Case	47	*Practical Letters*	63
For the Bookshelf	51	*Club Announcements*	64
A Model Wallis & Steevens Road Loco.	52		

SMOKE RINGS

Our Cover Picture

● ONCE A common feature of the English countryside, particularly in East Anglia and other open stretches of country, the old type windmill is now almost completely extinct, and the model shown represents the mill at Cranbrook, Kent, which is a typical smock windmill and one of the very few examples of these mills still in working order. It was built in 1814 by J. B. Humphrey. It measures 72 ft. from ground to cap, and has an octagonal smock of wood on a three-storied brick base. Originally, it had four common sails and no fantail, the cap being rotated by an endless rope running over a wheel at its side, operating through spur and worm gearing. About 1835, the fantail and an iron windshaft were fitted, and also a set of patent sweeps 74 ft. in diameter of the type invented by Sir William Cubitt, in 1807. Normal speed of rotation was about 18 r.p.m. The shutters of the sweeps are controlled through bell-cranks and rack and pinion gearing, so that they can be adjusted simultaneously without stopping the mill, and counterweights are fitted to balance the shutters in the desired position against the wind pressure. In this way, a controlled amount of air may be spilled from the sails and the speed thereby governed. A further measure of control is provided by a wooden brake-wheel surrounded by a wooden friction brake, and with this is incorporated the large wooden crown wheel, driving a bevel pinion on the vertical iron driving shaft which transmits power to three pairs of millstones, each 50 in. diameter.

On the floor below the stones are a belt-driven dressing machine and boulter, and on the floor under the gallery is a jumper. This mill ran as a pure windmill until 1863, when a steam engine was installed to assist with the load, and later a suction gas engine driving four additional pairs of stones was fitted.

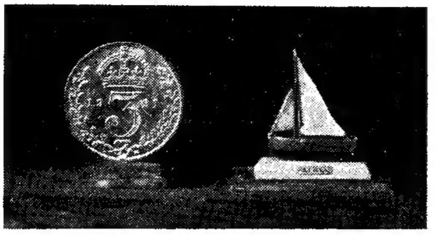
The model was made by Kenneth J. Tarrant, to a scale of $\frac{1}{2}$ in. to the foot. (Crown copyright photograph from an exhibit in the Science Museum, South Kensington.)

Model Engineering in Knutsford

● WE LEARN from Mr. George Briggs, of the Gas Works House, Knutsford, Cheshire, that an attempt is being made to rally model enthusiasts in the locality with a view to forming a model engineering society. With this end in view, an exhibition of model engineering and handicrafts is being organised, under the auspices of the local Rotary Club, to be held on Friday and Saturday, September 2nd and 3rd, at Egerton School, Knutsford. The support of model engineering societies in the vicinity is solicited, and communications from anyone interested and willing to help in this venture will be welcomed by Mr. Briggs at the above address.

The Smallest Exhibition Model

● THE MODEL shown in our illustration on this page can surely claim the distinction of being the smallest model to be on show in the MODEL ENGINEER Exhibition this year. On comparing the silver threepenny-piece with the actual size of the model, Mr. R. Butler, of Ramsgate, who made the model, writes of it: "I made it very quickly just as a novelty for our local club's exhibition . . . The model is a true scale one of a standing lug or gunter-rigged sailing boat, the original of which I sailed myself. It has a fully shaped hull and is complete with centre-board case, thwarts, horse, etc. The sails are of the finest cigarette paper and the rigging is made of split human hair. The hull was filed from brass. The name is engraved on a silver plate." The small yachts sometimes shown in conjunction with miniature models of larger vessels have approached this one in size, but we do not remember having seen one quite as small. Whether this example will produce a crop of still smaller models remains to be seen.



Model Power Boat Facilities

● DESPITE THE fact that innumerable ponds, lakes and other stretches of water of a suitable nature for sailing model yachts and power boats are to be found all over Britain, it is becoming increasingly difficult for model engineers to obtain access to them for this purpose. So serious is this problem becoming that many clubs find it impossible to hold regattas, and one of the most progressive and interesting branches of model engineering is sadly hampered thereby. Local councils have been very apathetic to the requests of clubs for the use of water in public parks. A typical case of the difficulties under which model engineers labour in this respect occurred recently at the annual regatta of the Malden S.M.E., which was held at the Kingsmere Lake, on Wimbledon Common. The boats had to share the lake with countless children, rubber dinghies and ducks, not to mention flotsam and jetsam which included branches of trees, cans and broken bottles—small wonder then that many mishaps took place, particularly in the running of racing boats, and the day's misfortunes culminated with the wreck of Messrs. Jutton's famous record-breaking flash steamer *Vesta II*.

A good many comments have been made about the unsatisfactory progress in model power boats in recent years, and no doubt there are many reasons for this; but we feel sure that an important contributory cause is the lack of a sufficient number of ponds which can be used both for practice runs and organised events. It is fairly certain that many clubs would make much better progress if they could be allowed the exclusive use of local ponds for a few hours every week, and given permission to erect temporary enclosures at the pond-side on regatta days.

Putting Weymouth on the Map

● AN INTERESTING letter has come to hand from Mr. W. C. L. Beavis, hon. secretary of the recently-formed Weymouth and District Model Engineering Society. He states that the present membership numbers fourteen, and he has been interested to see which branches of our hobby are represented by these first members.

Locomotives definitely have the majority, sizes ranging from "OO" to 3½-in. gauge. Boats, both sail and powered, come next. In the i.c. group, two compression-ignition engines have been run at the meetings, one of them being to the recent "Batti-wallah" design with home-made castings. Petrol engines, so far, are conspicuous by their absence!

The boat enthusiasts are planning to "mass produce" three R.A.F. high-speed rescue launches which are to be powered by c.i. engines, with the help of the c.i. experts, the idea being to have, as quickly as possible, some models for exhibition and demonstration in the club. If anywhere can be found to run them, these three similar models should provide some interesting competitions.

Evidently, the team spirit is very much alive in the society, and we hope to hear more about it in the future. Meanwhile, if any other readers are interested in joining this growing and enthusiastic club, Mr. Beavis would be pleased, we are sure, to provide all necessary information. His address is: 9, Belle Vue Road, Rodwell, Weymouth.

Recent Exhibition at Ickenham

● MR. H. C. PIGGOTT has sent us an account of the first exhibition held by the Ickenham Society of Model Engineers; it was held in the Village Hall and it seems to have attracted considerable attention locally. A 120-ft. passenger-carrying track was operating outside the hall, and in addition to engines owned by local members, there were some from Harrow taking their turns in running the traffic. The Hayes and Harlington Model Engineering Society also supported the show with loan models of various descriptions.

At intervals, there were given some demonstrations of control-line flying of aircraft, which is now becoming a popular feature at exhibitions of this kind.

The Ickenham society plans to cater for boats and small-scale model railways, and the 100-ft. portable track is nearing completion, while some track for "O" and "OO" gauge railways has been presented to the club by Mr. J. Shersby.

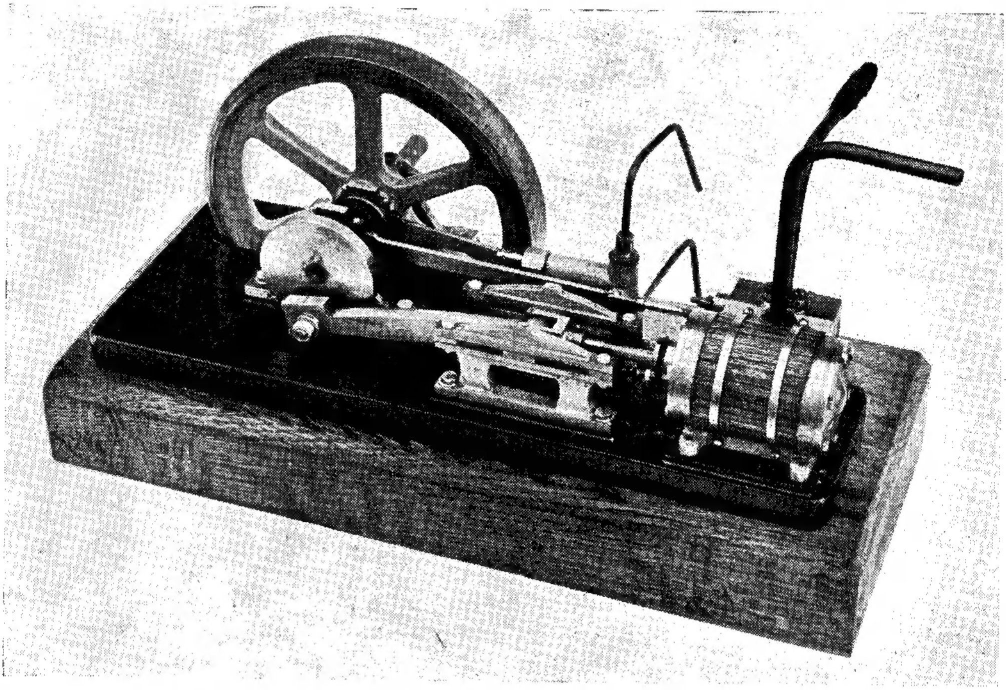
Correction

● WE HAVE been requested to point out that an error occurred in the list of Traction Engine drawings printed on page 790 of our June 30 issue. The correct selling price of Drawing No. T.E.6, the Aveling & Porter Type F 10-ton Road Roller is 4s. 6d.

*UTILITY STEAM ENGINES

by Edgar T. Westbury

READERS who have submitted comments on the design of small mill engines, and asked for their inclusion in this series of articles, may be interested to know that a new design for a horizontal mill engine has been introduced by Messrs. Kennion Bros. (Hertford) Ltd., and a photograph of this engine is shown herewith.



A new mill engine by Messrs. **Kennion** *Bros. (Hertford) Ltd.*

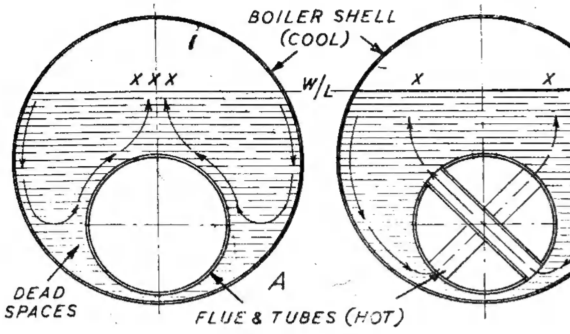
The size of the engine is 1-in. bore by $1\frac{1}{2}$-in. stroke, overall length being $12\frac{1}{2}$ in., width 6 in., height 6 in., and the flywheel 6 in. diameter. The weight of the finished engine is $9\frac{3}{4}$ lb. The base-plate, flywheel and crank-disc are in cast iron, and other castings in high quality gunmetal. As will be seen, the engine follows normal and well-tried principles of design. Castings and parts for this engine, including two fully detailed blueprints, are obtainable from Messrs. Kennion Bros., who are also prepared to supply some of the parts already machined.

Boiler Material

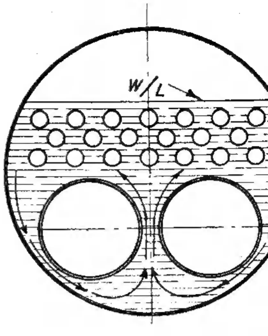
The material almost universally employed in the construction of model boilers is copper, and it would indeed be very difficult to find a metal more suitable in all respects, including commercial economy and availability, facility of construction, freedom from corrosion, conductivity, and mechanical strength. Only in cases where it is necessary to work at extreme temperatures and steam pressures is copper likely to be found wanting, and such eventualities are rare in model engineering, at least where the boiler is of more or less normal design. Copper is one of the easiest metals to form into complex shapes by beating, pressing or spinning, and unlike some of the other ductile metals, it has a high strength when thus formed, especially as it becomes hardened in the normal course of working; it can also be fabricated by various processes, including riveting, soldering, brazing and fusion-welding.

All this is, of course, elementary, but it is surprising how often attempts are made to improve upon copper in model boiler construction, or to find more readily available substitutes. In the attempt to reduce weight, aluminium or its alloys have been tried, but the obvious difficulty here is in fabricating such material by soldering or brazing; and welding, though possible, is

**Continued from page* 810, *Vol.* 100. "M.E." *June* 30, 1949.



Convection currents in boilers with internal furnaces



Convection currents in return-tube boiler

by no means easy with the ordinary facilities of the home workshop. Aluminium, and most of its alloys, become mechanically weak at a much lower temperature than copper ; pure aluminium has a lower cold strength than copper, and though very strong alloys are available, some of them are unsatisfactory in respect of corrosion resistance. Nevertheless, it is possible that aluminium boilers may be quite satisfactory for certain purposes.

Steel boilers have been used with success in some model steam plants, but ordinary steel has a low corrosion resistance, and unless great care is taken in completely drying out the boilers after use, or other methods of protection are adopted, serious wastage and weakening of the boiler material may take place. In full-size boilers, apart from care taken to ensure purity of feedwater, and periodic inspection and test, it is common to use galvanic (or correctly speaking, electrolytic) methods of corrosion prevention, such as by suspending zinc plates in the water space of the boiler, to act as anodes in a galvanic couple, or by using iron anodes and connecting them to the positive pole of a low-voltage current supply, the boiler itself being negative. The use of stainless-steel, however, will dispose of the corrosion trouble, and is quite practicable in boilers of small size ; at least one very successful example of a model locomotive with a stainless-steel boiler has been in regular use for many years.

Thermal Efficiency

It may be taken as an axiom in boiler design that the most important factor in thermal efficiency is the area of really effective heating

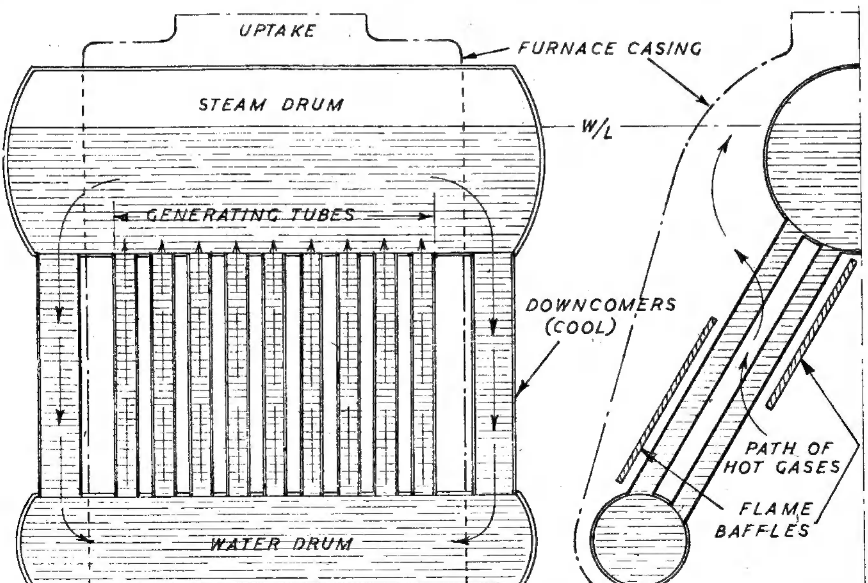
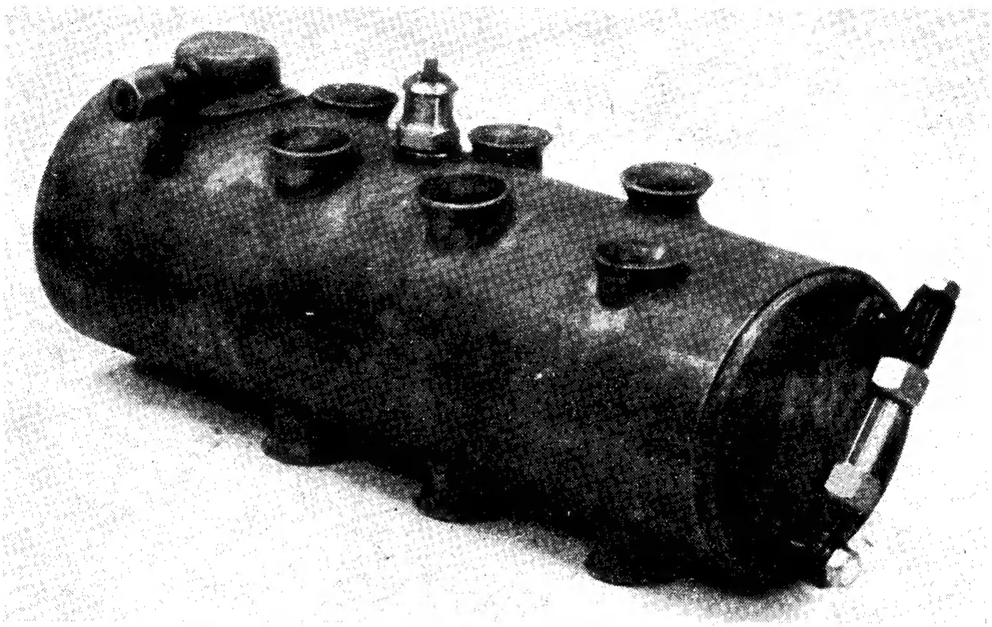


Diagram illustrating theory of circulation in Yarrow type water-tube boiler

surface, in conjunction with the conductivity of the material. One must be careful to specify "effective" heating surface, however, because it is quite possible to produce a boiler in which the mere addition of surface area in the steam generating elements may have zero or even negative value; the term may be defined as surface on which the burner flame, or hot flue gases, impinges in such a way as to transmit of material than is really necessary for considerations of mechanical strength.

When a very high rate of steam production in a boiler of a given size is called for, the greatest difficulty is not the transmission of heat to the boiler, but the "control of traffic" inside it, in such a way as to enable the water and steam to be segregated, to avoid priming, and ensure that only dry steam reaches the engine. As



A fast-steaming boiler with vertical internal flues, by the Imperial Co., Cranbrook Road, Ilford

heat to the metal, and eventually to the water inside the boiler. It is not, however, easy to lay down hard and fast rules for the design of small boilers which conform to these conditions, and one important fact which is only too often neglected is that boiler and burner design should not be isolated, but regarded as complementary to each other, and arranged accordingly. There is also room for experiment and constructive reasoning in the exploitation of heat-insulating lagging, refractory furnace lining or radiant-heat reflectors, and flame baffles, all of which could be used to increase the thermal efficiency of small boilers.

It is often stated that it is undesirable to use thick material for the shell and generating tubes of small boilers, on the grounds that it will reduce the rate of heat transmission and thereby lower efficiency. This seems hardly reasonable, as the heat conductivity of most metals is well above that of the water itself; neither is it borne out by such tests as I have been able to make or to witness. But, wherever the power/weight ratio of the plant is important, it becomes necessary to keep down the amount of metal in the boiler as much as possible, and even so, most small boilers have much greater thickness

already pointed out, the internal design of the boiler steam and water spaces then becomes an important consideration, with the object of obtaining an ordered circulation flow and avoiding surging or ebullition. This is much more difficult in small boilers than large ones, not only because of the very small space available for collecting the steam, but also because natural circulation depends on convection, or in other words, the difference in density between water at two different temperature levels, causing the heated water continually to rise in the boiler drum or tubes, and its place to be taken by the cooler water which it displaces. The greater the vertical distance through which the water can move, and the greater the difference in temperature between the hottest and coolest water in the generating space, the more positive and rapid will be the circulation. Again, elementary theory—but so often forgotten or disregarded in model boiler design!

It follows, therefore, that in either a fire-tube or a water-tube boiler intended for very rapid steaming, the internal design of the boiler should be arranged so that there is free and smooth "one-way traffic" upwards through the generating tubes and downwards through the steam

and water drums, also that the maximum difference of level between the two ends of the generating tubes is obtained in order to promote circulation by convection, or what is known as the thermo-syphon system.

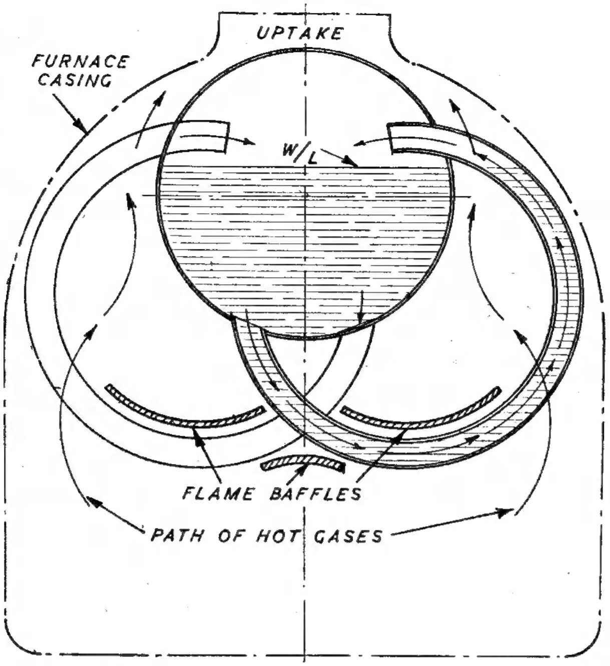
Convection Currents

The importance of arranging an orderly system of circulation is readily understood if one considers the effects of convection currents in boilers. In the case of the centre-flue boiler, for instance, there is normally a difference of temperature between the flue and the shell, the latter being the hotter of the two, so that the water in proximity to it tends to travel upwards while the cooler water near the shell travels downwards. There is, however, a " traffic bottle-neck " near the bottom of the boiler, as shown at A in the diagram, with the result that circulation tends to become sluggish or completely stagnant in the dead spaces each side of the flue.

In large boilers of this type, it has been known for the circulation to be so poor that it is possible to draw off cold or tepid water from the bottom of the boiler while it is in steam, a condition which is sometimes remedied by the fitting of " circulation augmenters " consisting of steam or water jets appropriately located to keep the water in motion at this point. While the " scale conductivity " of a small boiler is much better than that of a large one, so that it is unlikely that the water in the bottom of the boiler will remain cold under steaming conditions, it is still true that the efficiency of the boiler may be much impaired by poor circulation.

The fitting of " Galloway " water-tubes across the flue as shown at B will greatly facilitate free circulation by convection, and practically eliminate the dead spaces in the bottom of the boiler. In any case, however, any attempt to force the pace of steam generation is liable to cause ebullition, or violent agitation of the surface of the water at the points XX, and may result in priming.

In small " Scotch " or return-tube boilers with two or more flues, circulation is fairly good, and the increase in heating surface provided by the tubes is bound to improve thermal efficiency, but ebullition trouble is still probable if the boiler is forced, as I know from painful experience with full-size boilers of this type in naval craft.



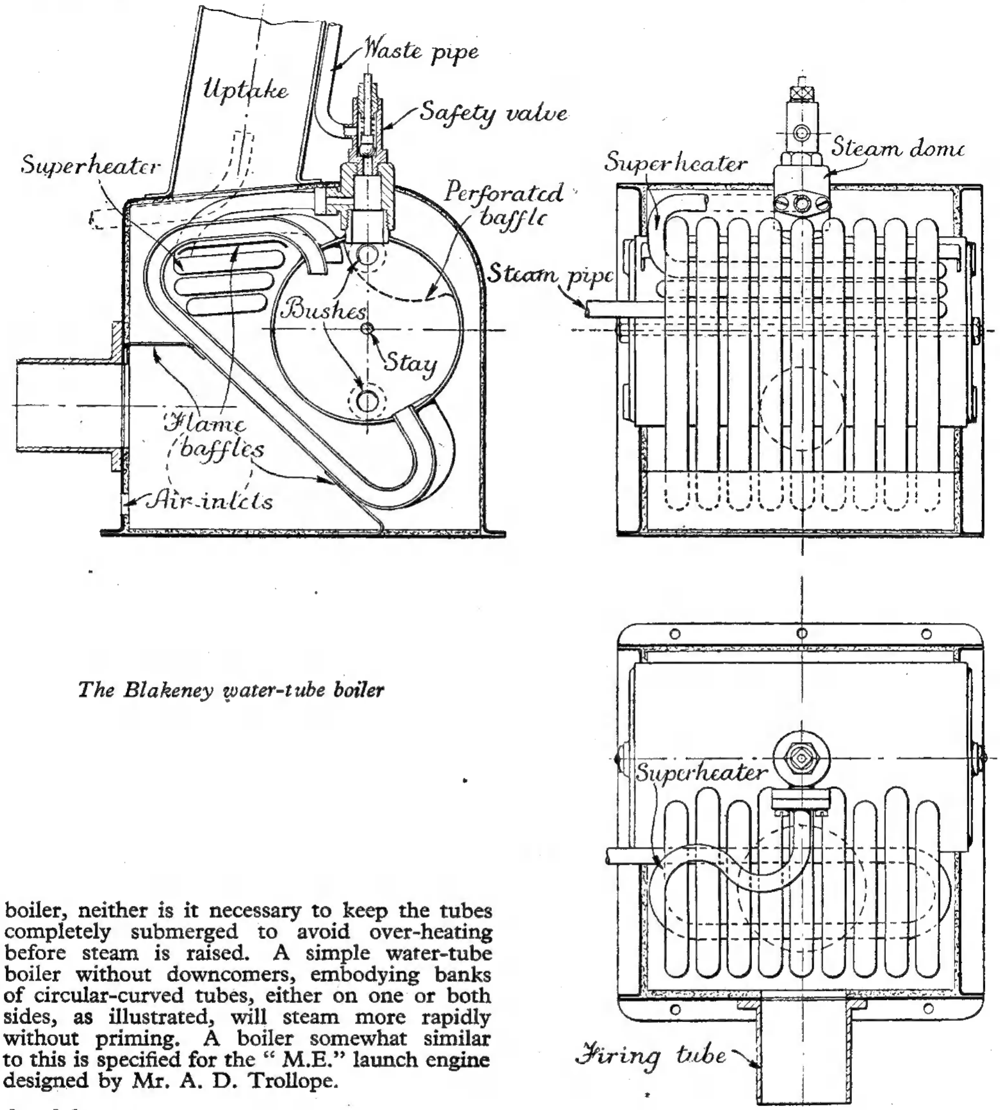
Simple loop-tube boiler, in which downcomers are unnecessary

It was mainly for this reason that the "Scotch" boiler was superseded in the Navy by water-tube boilers. One of the most successful of the early types which took its place was the Yarrow boiler, having inclined banks of water-tubes connecting upper and lower drums, and external downcomers of large area which, being much cooler than the generating tubes, promoted a downward flow of water to replace that displaced upwardly in the tubes. Similar principles and methods of construction were employed in the Thornycroft and White-Forster boilers, but in the Babcock boiler, although the basic principle of unidirectional circulation is much the same, the shape and method of construction are different. Nearly all of the modern types of water-tube boilers used in full-size practice embody similar principles of circulation.

A Freely-adapted Type

The above-mentioned boilers have been modelled fairly extensively, the Yarrow type being the more popular on account of its straightforward construction, but the design is often very freely adapted, only the characteristic inverted vee shape being copied faithfully ; as a matter of fact, the boiler would work just as well with only one " leg " (as shown in the half-end view) and the downcomers either put inside the furnace or omitted altogether. It is, however, only fair to place on record that such boilers have often been found entirely satisfactory for their intended purpose, and I would emphasise that it is only when boilers are used to their utmost steaming capacity that defects in the circulation system are found definitely harmful.

Much simpler forms of water-tube boilers, without downcomers, are often used in model practice and have been found to work well at very high rates of circulation. In full-size boilers, there is an objection to bent tubes, mainly on account of the difficulty in internal cleaning, but this does not apply seriously in a model



The Blakeney water-tube boiler

boiler, neither is it necessary to keep the tubes completely submerged to avoid over-heating before steam is raised. A simple water-tube boiler without downcomers, embodying banks of circular-curved tubes, either on one or both sides, as illustrated, will steam more rapidly without priming. A boiler somewhat similar to this is specified for the "M.E." launch engine designed by Mr. A. D. Trollope.

An Advantage

In many fast-steaming model water-tube boilers, it has been found an advantage to discharge the tubes above the water-line in the steam drum, so that circulation is not impeded by direct impact with the main body of water, and also to point the ends of the tubes downwards, so that the water which they contain is not thrown upwards into the steam collecting space.

It will be noted that the generating tubes discharge a mixture of water and steam, the former being much the denser, and relatively easy to direct in the way it should go. The steam, being a light vapour, has little momentum, and tends to rise immediately to the highest point in the boiler, where it should be collected. These principles are effectively carried out in the Blakeney boiler, which has already been mentioned, and for the benefit of those readers who are not familiar with the design, the drawing of it is reproduced herewith.

In many small boilers, the superheater coil really serves the purpose of a steam drier, to get rid of small particles of water carried over from the boiler at high rates of steaming; but it very often fails to cope with the faults of a badly designed boiler, and unless the coil is so large, and so effectively heated, as to constitute practically a separate "flash" boiler, priming may still occur, the effects of which are liable to be much more serious with a fast and hard-pressed engine than one of modest performance.

(*To be continued*)

A general view of the miscellaneous models stand

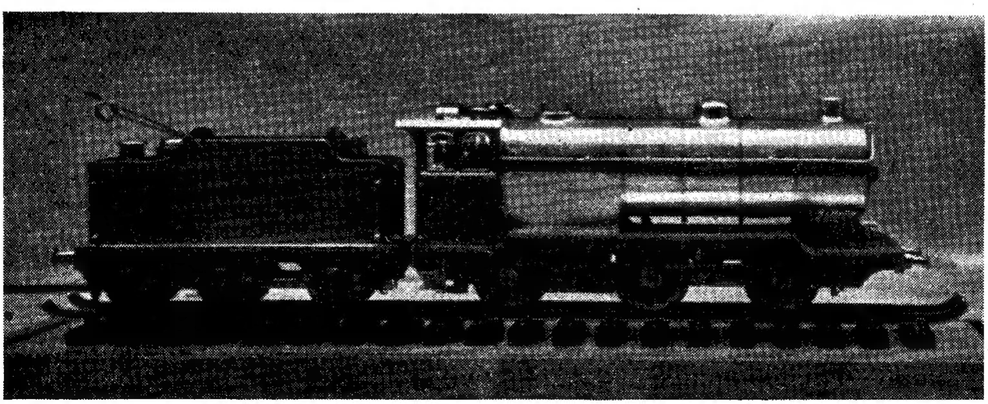
The Nottingham S.M.E. Exhibition

THE 13th Annual Exhibition of the above society was held at the Victoria Baths, Nottingham, and, without doubt, it proved to be the most successful exhibition yet held. The number of models greatly exceeded those on show in previous years, and the standard of craftsmanship was of a high order. It is the aim of the Society to provide fresh and novel features at each exhibition, and on this occasion, up-to-date interest was provided by a vertical car track, 12-ft. diameter constructed by members, around which a racing car, powered by a 1.3 c.c. diesel engine built specially for the track by Mr. W. K. Craw, performed amazingly well at an estimated speed of between 30 and 40 m.p.h.

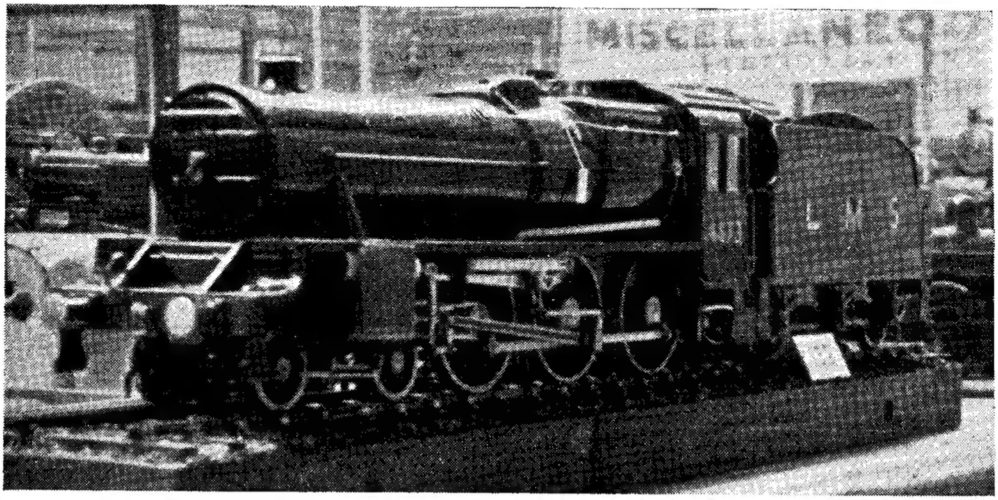
The loco section was well represented by some very fine models, and the Sine Nomini Cup was awarded to Mr. E. E. Brown for a very fine model, "O" gauge, J 38 Class L.N.E.R., coal-fired loco; Mr. Fletcher being second with a 2½-in. gauge *Green Arrow*; and Mr. Kullick, third, with a 2½-in. gauge W.D. *Austerity*.

The Marine Section was well stocked with some very fine model boats and engines, and the Carr Trophy was awarded to Mr. D. H. Day, for a very fine model launch, as yet unfinished. The second prize was awarded to Mr. E. W. Sheppard, and the third to Mr. F. A. Scotton.

The Wallis Birch Cup, premier award in the miscellaneous section was given to Mr. Hollingsworth, who entered the "M.E." Drilling Machine with attachments, the second prize went to Mr.



Mr. E. Brown's 0-6-0 J38 class ex L.N.E.R. "O" gauge coal-fired locomotive. Winner of the Sine Nomini Cup



Mr. J. Knighton's 3½ in. gauge Class 5 mixed traffic locomotive. Winner of the second prize in the open competition

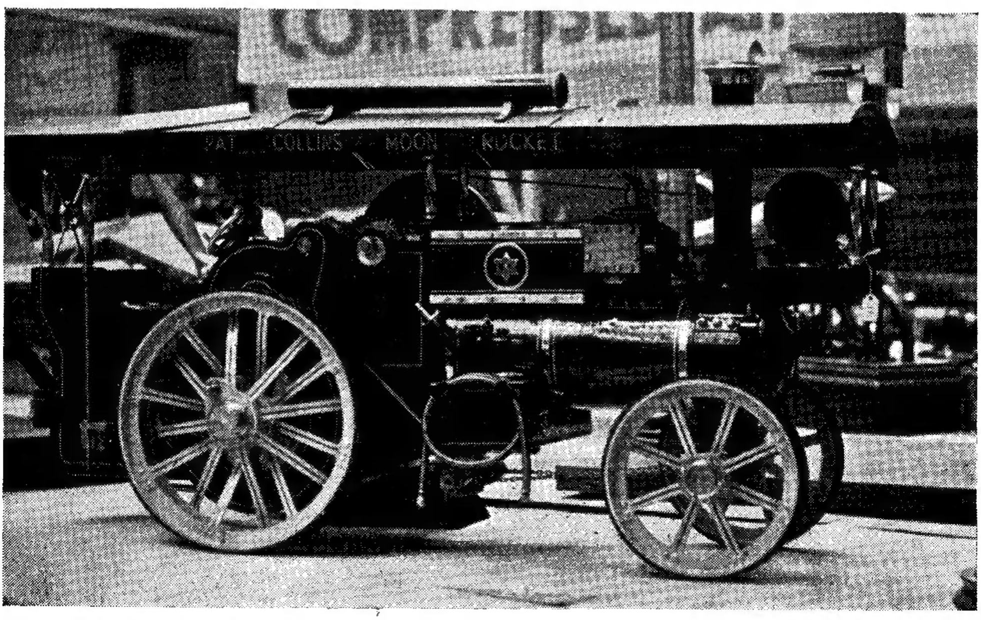
J. S. Tilson for his 1-in. scale Traction Engine, and the third to Mr. S. J. Bradley for his Triple Expansion Marine Engine..

In the Open Competition; first, second and third prizes were awarded to Messrs. Spafford, Knighton and Swallow, respectively.

The Pool Trophy for the best exhibit in the show was awarded to Mr. J. Stirland for his model Showman's Road Loco., illustrated below.

Mr. H. Wilshaw, who used to hold the position of Secretary of the Society, was awarded the John Dakin Cup, donated in memory of the late John Dakin, who was a member of the Society.

The photographs were taken by Mr. W. R. Coates, a member of the Society.



Mr. J. Stirland's model showman's road locomotive. Winner of the Pool Trophy

A Vision of the Future

by "L.B.S.C."

THIS is being written on the Saturday before Whitsun, and despite the trouble on the old L.N.E.R., the holiday spirit is in the air; so I propose we give the construction notes a rest this week, and indulge in a little recreation. All work and no play still makes Jack a dull boy! It is Derby day, too, and judging by the crowded trains passing my window on their way to Tattenham Corner, there is a tidy crowd up on the Downs. In days gone by, I worked on the race specials on many occasions, and remember well all the "side shows" which were attendant on the big race meeting. One of the most popular was the old gipsy who told fortunes—or reckoned she did—by looking into a crystal. Well, what do you say if we do a spot of crystal-gazing ourselves, and see what the railways will be like in the years to come? O.K.?—right, let's go . . . .

It is a pleasant summer evening in the late nineteen-seventies. The scene is the down main-line platform at Carlisle Station. Near the end of the platform stands a middle-aged man, looking about as if he were expecting to meet a friend. Another man about the same age, is walking toward the end of the platform; he looks like a commercial traveller, and is carrying a bag. Suddenly he sights our first-mentioned friend, and hastens toward him with outstretched hand.

"Why, hello there, George! Say, it's real good to see you again!"

"Hello, Al, old boy—so glad I didn't miss you. Have a good trip over? When did you land?"

"This morning, at Prestwick, off the air liner. I 'phoned you as soon as I could, as I reckoned to break my journey to London here, for an hour or so, and hoped you could meet me and spill all the beans."

"I certainly will. First of all, how have you been keeping, and how's the family over yonder?"—and for the next five minutes, the old friends converse on matters that don't concern us in the slightest. Then suddenly Al says to George: "Listen—tell me what happened to your railroads; they had a big showdown a little way back, didn't they?"

"You said it, brother," replies George with a smile. "You'll remember how the old groups were nationalised in 1948, and combined under the title of British Railways. Well, it was another case of theory versus practice. In theory, the nationalisation stunt was fine; but in practice it didn't pan out right at all. First of all there were increases in fares and rates, which naturally didn't meet with the approval of passengers and traders, who thought that the profits of the old companies should be used to *lower* fares and rates. Then there were strikes and unrest among the railwaymen themselves, who reckoned that the profits should have been used to raise their wages and better their conditions. You know the old saying that 'between two stools we fall to the ground.' The railways got between the two stools all right; things went from bad to worse, and finally, when an entirely new government came into power, they decided that something had to be done about it.

"After much deliberation, it was decided that the best thing to do, was to revert to company operation, and revive the old friendly competitive spirit outside, and the team spirit inside. Six new railway companies were formed; Southern, Great Western, Great Eastern, North Eastern, London and North Western, and Caledonian. The six regions were leased to them indefinitely, the only condition being that the government should get a certain percentage of any profits; they could run them by any means they wished, to ensure efficiency in operation, and first-class service to the public in general. The new directors met the union leaders; all the cards were put on the table; they got cracking—and boy—DID it work?"

"Well," says Al, "I guess this old depot looks busy and prosperous right now; what's the special hustle going on down there?"

"The Scottie, 2 o'clock from Euston, is due now—why, here she comes, three minutes early!"

As George speaks, a long train slides quietly into the platform, and comes to rest with the engine right opposite where our friends are standing; and *what* an engine! A sleek, black 4-6-4, the embodiment of power and speed, yet withal graceful—no "streamline" casing, nor any adornments whatever, to spoil her natural outline. She is slightly longer than the old "Duchess" class that ran on the L.M.S. some forty years ago. The boiler is about the same diameter, slightly tapered, with a little longer firebox. The front of the smokebox is shaped somewhat like the nose of a shell. The chimney is of fairly large diameter, but not unsightly; it has a silvery ring around the top, and a square base, ring and base almost meeting. The dome is large and squat, but its oval shape is pleasing in appearance, and matches the boiler, whilst the four safety-valves are in a casing, with a whistle lying lengthwise at each side. The front of the cab is rounded a little, and slopes back like the windshield of a motorcar; the sides have windows, but the outline is distinctly reminiscent of the old L.N.W.R. So is the tender, except that it runs on two four-wheeled bogies, and the sides are not as high as the cab roof, as they were on the L.M.S. engines.

She has four cylinders, the outside pair being set back somewhat like the old G.W.R. engines of Churchward days; the inside pair are well

forward, the drive being divided, with the cranks at 180 degrees, or exactly opposite. The cylinders are very large in diameter; and to get them within the overall limits of the load gauge, the inside cylinder casting forms part of the frame, extending over the leading bogie wheels, whilst the outside pair, located just behind them, are recessed into the frame. She has four independent valve-gears, made of an extra-strong steel Western Pacific, with all the latest improvements, took the train down, averaging over 65 miles per hour, start to stop, with 18 coaches. Her number was 111, and her name *The Great Bear*."

"Britishers sure are sentimental" rejoins Al. "But listen; you're a star turn at locomotive knowledge; what do you know about this baby?"

"Let's talk to the driver before he cuts off the train," says George. "As he's arrived early,

Photo by] [*Raphael Studios, Hythe*

"Green Goddess" (Driver Barlow) and "Hurricane" (Driver Hobbs) at Hythe Station, Romney, Hythe & Dymchurch Railway

alloy, newly discovered, that allows the parts to be made about half the size and cross-section used in the old days. Connecting- and coupling-rods are made of the same material. The driving-wheels are 6 ft. 3 in. diameter, and a single long splasher covers them; the brass nameplate bears the inscription "L. & N.W.R., Crewe Works, 1975," and the cab has an oblong number plate on it, with raised brass figures. She is beautifully clean, merely carrying the dust of the long run from Euston.

"Migosh, she's a swell locomotive," says Al in admiration, and then he takes a look at the number and name—1304, *Jeanie Deans*—and continues, "Say, George, that name hits a memory chord. Didn't a locomotive of the same name run the old 'Corridor' out from Euston about a century ago?"

"Quite right, Al," says George. "It was always a tradition on the old L.N.W.R. to perpetuate the names of their engines; when one went to the scrap heap, its name was transferred to a new one. The new companies all do their best to keep old memories alive; why, when I went to Torquay for my holidays last year, a brand-new Great he won't go for a minute or two," and they walk up to the cab. "Hey, Bill," says George "have a good run?"

"We did," says Bill. "Five minutes early at Crewe, lost 'em through three p-way checks, never dropped below 55 up Shap, and if I hadn't held her in coming down, we'd have been here long before time."

"Good," says George. "My friend here wants to know the tricks of this engine—can you tell him before you come off? You can explain better than I can."

"Righteeo," says Bill. "She's got four cylinders and four sets of gear; two very big cylinders, and two not so big. Now you know how old Churchward's doings went on the old G.W.R. and you know how that French engineer chappie Chapelon—ha, ha! no pun intended, that was a slip of the tongue—built compounds that were the cat's whiskers. This engine combines the two. We start off like Churchward, all cylinders taking steam from the boiler; an automatic valve regulates the steam-chest pressure in the big cylinders, so both sets do equal work. By using the regulator plus our noddles, we get away

without slip, and accelerate like a ' Milly Amp ' outfit. I got 18 on, yet I passed Kilburn at 65, and was doing 90 at Willesden. Now then—this is how we hit the high spots ; we work ' Churchward ' until we're doing between 75 and 80, and all cylinders notched up to about 15 per cent. cut-off ; then, when we can't notch up any more, we just turn the exhaust from the smaller cylinders into the bigger ones, and work ' Chapelon.' Our C.M.E. says it's equal to a 2 per cent. cut-off, and I reckon he's about right. When working compound, we leave the first cut-off at 15 per cent., and let the second one down a bit, so as to do away with compression and back pressure ; and though we've got 250 lb. in the boiler, you can't hear the exhaust. Speed ?—well, two miles a minute easy on the level. The way she's balanced, and the lightness of the motion, lets her turn the wheels so fast you can't see the coupling-rods ; the light blast keeps the steam gauge needle where it belongs, because she has a mechanical stoker, which maintains an even fire all over the grate, yet only about 4 in. thick, so it doesn't need much draught. Once she's in her stride, I only need to go back to ' Churchward ' for a heavy bank like Shap ; and at that, she flew up with no more than 17 per cent. cut-off."

" Yus, an' ony anuvver 'arf-a-turn on the stoker-injin valve," chips in Bert, the ginger-headed Cockney fireman, with a broad grin. " No blinkin' shovellin' an' no clinkers—blimey, the work's orl put aht on these 'ere injins ! Tike a dekko at me dial and maulers arter free 'underd miles ; why, you'd fink I was a City clurk ! " He is quite right ; neither he nor the driver are more than just a bit dusty and " travel-stained " ; the nigger-minstrel appearance of the engine crews of bygone days, is a thing of the past.

At that instant, the shunt signal at the end of the platform turns green, and Bill, with a " Cheerio, friends ! " eases his modern *Jeanie Deans* away from the train, and disappears in the direction of the engine sheds. Al turns to George and exclaims " Well, it beats the band ! That's just the simplest and cutest stunt I've ever heard of—a simple compound ! Those ' froggies ' your friend Bill mentioned, sure were good engines, but they ran with over 50 per cent. cut-off in the high-pressure cylinders even at full speed, and worked compound from the first turn of the wheels ; but Bill's black beauty only goes over to compound as a means of getting extra expansion when she can't get any more as a simple. Yes, I'll say that's a red-hot idea ! "

" Red-hot, is just exactly what it is," says George, " literally, for Bill didn't have time to tell you that the boiler barrel is nearly all superheater flues, and when he changes her over to compound, the exhaust is reheated before it has its last final kick at the pistons in the bigger cylinders. He also didn't mention that all the axleboxes have roller bearings, and every joint in the valve gears has either a ball or roller bearing, so hot boxes and worn pins are long since finished and forgotten. They're lubricated with soft grease. The only places needing oil, are the joints in the brake gear."

Whilst George is speaking, a vision in blue glides slowly into the platform and backs on to the train. Clang ! goes the automatic coupler as she makes contact. The fireman jumps down, couples up the air-brake and train-heating pipes, pushes in the plug of the jumper carrying the electric alarm and telephone wires, and calls out " Richt, Jock ! " Sssssssssss ! goes the air valve as the driver makes his brake test, followed by the " Siss-phut-siss-phut ! " of the duplex Westinghouse donkey-pump as it makes good the air pressure in the reservoirs and train pipe. " Boy, oh boy ! " says Al. " Isn't she a smasher ? " chimes in George, as they both gaze at the locomotive in admiration.

The newcomer is painted dark blue, lined black and white, with the letters C.R. on the tender, and a garter and crest between. On the side of the cab is an oval brass plate engraved " Caledonian Railway, 903," and on the long single splasher is emblazoned the name *Cardean*. But *what* a difference from the famous engine of that name, that ran in days gone by ! This one is a four-cylinder 4-8-2, about the same size as her black sister who brought the train from Euston. She also has a fairly wide chimney, just peeping above the smokebox, but it is all black with a round base ; and a single large " tube " whistle lies beside the safety-valve casing. She also has the cab with the rounded and sloped " automobile " front, but the rear part is unmistakably " Caley," and there are two miniature electric headlamps at the top corners. Surmounting the shell nose of the smokebox is a little white double semaphore. The tender runs on two bogies with outside frames, and compensated springing.

The cylinders are arranged as on the L.N.W.R. engine, but are all the same size, 22 in. diameter and 28 in. stroke ; the outside cylinders drive the third pair of seventy-inch wheels, and the inside cylinders drive the first pair. All the motion-work is in the new alloy steel, very light and elegant, but immensely strong. The cranks are set at 135 deg. giving eight beats per turn ; the inside valves are actuated by the latest version of the Holcroft conjugated gear, a self-contained unit located between the two pairs of cylinders. She has ball and roller bearings throughout. Like the modern *Jeanie Deans*, the new *Cardean* has a big combustion chamber, a boiler barrel nearly full of superheater flues, and a mechanical stoker. Our friends walk up to the engine.

" Good evening, Jock," says George. " My friend and I were just admiring your little blue baby. How does she go up Beattock bank ? "

" Mon," says Jock very soberly, " Beattock's no' a bank ony mair. On this lassie's verra first trip she juist flattened it oot ! " This remark brings a smile to both our friends' faces, and Al rejoins " Is that so ? Well, Jock, let's have the lowdown on how she does it. How do you run her ? "

" Ye see, mon " explains Jock, " she's a puir simple lassie takkin' boiler steam in a' her four ceelinders, but she's aye frugal wi' it. I only gie her a wee bit regulator tae start ; she disna' need muckle steam behind the big pistons when she gies the cranks eight pushes tae a turrrn, and Muster Holcroft's valve gear sees that a' get a fair share. Noo, when she's awa' and I

notch oop, I gies her mair regulator, an' keep on till she's back tae fufteen per cent. cut-off, an' a' the throttle. Noo she's sae weel balanced, an' gets rid o' her exhaust steam sae free, that she'd rin an' rin, an' land us a' in perdition if I let her gang her ain way: sae when she's rinnin' aboot a mile-an-'a-haff tae the meenit, I juist turrrrn this wee valve here," and he indicated a small wheel close to the regulator handle. "That cuts oot the main supply o' steam tae the inside ceelinders, but lets juist a wee whiff keep ganging in tae stop the pistons frae dragging, an' keeps oop the lubreecation. The ootside ceelinders then keep her ganging; an' ony a mickle bit o' steam they need tae keep her a-rinnin' like a frichtened Hielan' deer. A' I hae tae dae when we mak' Beattock, is tae open the wee valve again, an' she juist flees oop wi'oot sae muckle as a check. Aye—she's a real bonnie lassie; we hae saxteen o' her seesters at Pommadee the noo—*Doonalastair Eglinton*—aye, mon, 'tis gran' tae see the auld names; an' they say there's mair tae come."

As Jock ceases speaking, Sandy, the fireman, glances at the station clock, and opens the valve of the mechanical stoker. Clink-clank-clink-clank goes the stoker engine, and Jock opens the blower valve a little; a soft, deep-throated buzzing comes from the safety-valve casing. The steam gauge finger points to 250 lb. The pleasant voice of a woman announcer comes from the loud speakers above the platform "Train for Glasgow only, leaving in two minutes—take your seats, please!" The guard comes up with train sheet—"Eighteen on, Jock, right time away"; there is a last-minute scramble down the platform as a final load of baggage is dumped into the guard's van. Doors are rapidly slammed; folk on the platform step back from the train; "Right forward" calls a porter at the front end; then "Pheeeeep" goes the guard's whistle as he waves his green flag. Sandy gives a tug at the whistle cord, and *Cardean* looses off a blast from her Caledonian hooter that sounds like the *Queen Elizabeth* leaving Southampton. Then Jock slowly opens his regulator a wee bit, and the big engine gives a quiver as her eight driving-wheels bite into the railheads, and she takes the strain; but without the ghost of a slip, and with a seemingly unlimited reserve of power, she quietly moves off to the accompaniment of a rapid succession of "whuff-whuff-whuff-whuffs" from her saucer-like chimney. The eighteen claret-and-white West Coast Joint Stock coaches, metal-panelled, air-conditioned, and on roller bearings, glide past Al and George, rapidly accelerating until the guard's van passes at over twenty miles per hour. The two friends stand and watch the receding train until it disappears from sight.

"Well, old man," says George, breaking the silence, "what do you think of that little lot? Bit different from the old days, eh?"

"I'll say it is," replies Al. "But listen, George. When I was over here last, about twenty years ago, I recollect all the steam-hauled trains had the vacuum brake. I see both the Nor' West and the Caley locomotives had duplex air compressors like our own locomotives over yonder. How come?"

"Simple," says George. "You know London and the South pretty well, and so I don't need to remind you that all the electric suburban services, such as the London Underground, and the Southern electric trains, both main line and suburban, all use the Westinghouse quick-acting air brake. When trains accelerate quickly and run at high speed, you have to be able to stop quickly as well. It was found that the vacuum brake was far too slow in action for the electric trains, so they adopted the air brake. When the steam trains speeded up to averages of ninety miles per hour or more, and two miles a minute began to get quite common for locomotives like we've just seen, it was realised the vacuum brake was hopeless, for the simple reason that you couldn't apply the braking power without cylinders nearly as big as the coaches themselves, and too slow because you can't increase the free atmospheric pressure. It will only flow into even perfect vacuum at a certain speed. So the vacuum apparatus was just scrapped, and the latest type of air brake, with instantaneous electric application throughout the train, was fitted to all main-line rolling-stock. Accidents now, are non-existent; no casualties for many years."

"Just one more quiz, George," says Al. "I sure expected to find a crowd of diesels, gas turbines and what-have-you, hauling tonnage on your railroads, yet the steam locomotive is still tops. Any special reason for that—didn't the i.c. engines do their stuff?"

"Diesels—turbines—them things!" retorts George, emphatically, if ungrammatically. "That wretched thing they tried on the old L.M.S. was everlasting breaking down, and being towed home by a steam engine, train and all. It cost goodness knows how much to build and maintain, nearly poisoned all the passengers in the tunnels, and throbbed the heart out of every engine crew who tried to run it. Above all, it needed imported fuel; and it couldn't half mop it up! Pretty much the same thing happened to the turbine monstrosities; just complicated boxes of tricks, they were. Fancy an engine having to develop about ten thousand horse-power, to deliver two thousand at the driving wheels! Whatever the theoretical gain in thermal efficiency might have been, on the road they proved nothing more than a never-ending source of trouble; and when these new steam locomotives came out, burning home-produced fuel—and not much of it!—simple, easy to run and maintain, and able to be operated efficiently and fully understood by the average engine crew, they simply ran the stink-boxes off the road."

"Well, I guess time proves all things" says Al. Then suddenly, "Say, George, do you still read THE MODEL ENGINEER?"

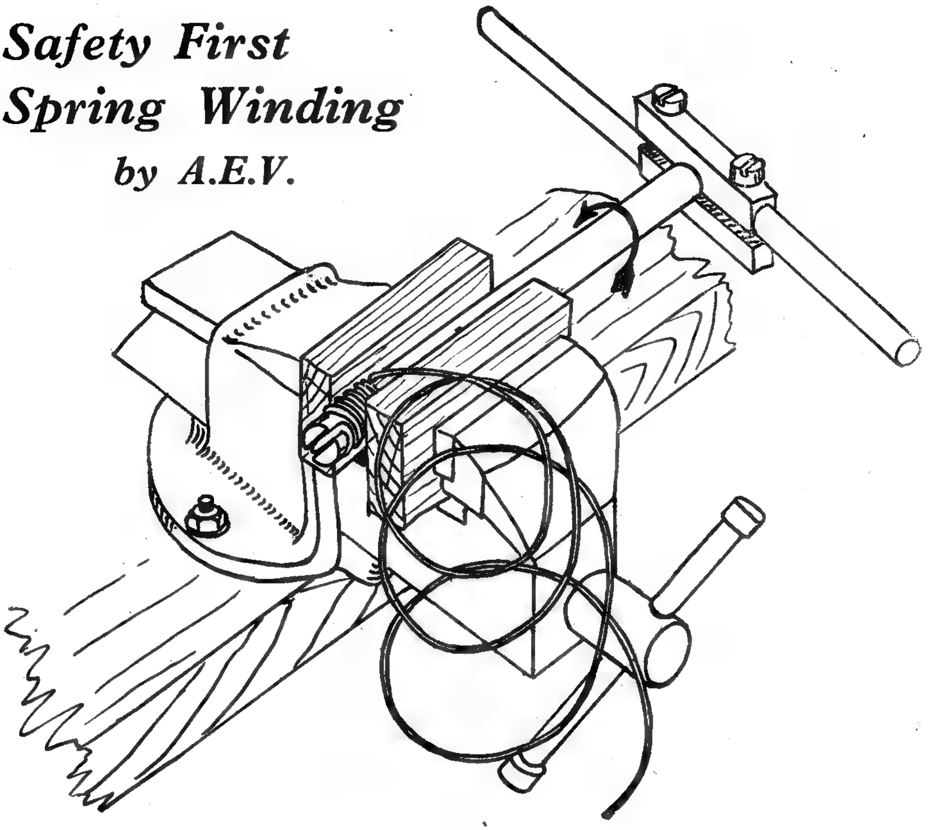
"Of course I do" replies George. "And though I'm no thought-reader, I'll bet you're thinking of 'L.B.S.C.' who used to write the locomotive-building notes"

"Great minds still think alike" retorts Al with a smile. "When that guy first started writing, half a century or more ago, his ideas were just laughed at as being plumb crazy. I wasn't born then, but I heard all about it when a kid at school. I saw one of his engines once; it was a Pacific

(*Continued on next page*)

Safety First Spring Winding

by A.E.V.



MOST model engineers wind their springs on a mandrel in the lathe, but a far easier and safer method is to wind them in the bench vice as illustrated in the sketch above and as follows :

First cut a notch, or drill a hole, in the end of the mandrel, then hold the mandrel in the vice (level with floor) between two pieces of wood. Fasten a tap wrench on the free end of the mandrel, insert the spring wire in the notch and rotate the mandrel. When the spring is long enough, remove the wrench and release the pressure of the vice, allowing the mandrel to rotate as the spring uncoils slightly. The sharp edge of the notch or hole should be removed, otherwise the wire will shear as winding is commenced. I have made springs of 0.156-in. diameter wire by this method.

A Vision of the Future

(*Continued from previous page*)

named *Tugboat Annie*. There was something about both those locomotives we have just seen, that I couldn't place—but I've got it now. Get me ? "

" I do," replies George. " I also recollect that he built a little Webb compound, a small copy of the first *Jeanie Deans*, that ran like a deer on practically no steam. Yes, I get you all right ! "

Al coughs. " Say, I guess my throat is getting just a mite dry. Let's mosey down to the lunch counter and toast old Curly's memory in what he called a cup of the engineman's best friend."

" Lead on, brother " replies George ; and they stroll down the long platform towards the refreshment room.

And so the vision fades—

A Locomotive Carrying Case

by A. R. Turpin

IT would appear to the writer that the usual procedure amongst locomotive builders is to wait until their work of years gets [redacted] nasty knock, and then start to think about building [redacted] carrying-case for it. On the other hand, [redacted] friend of mine always starts [redacted] new locomotive by building the case first; he suggests that a case is just as necessary whilst the engine is being constructed, [redacted] it is when finished, and besides, before assembly all the bits and pieces [redacted] be kept in it, and there is not the danger of losing pieces or worse still—and I have known this happen more than once—make the same piece twice, when the construction spreads over [redacted] number of years, this is easier to do than might be imagined.

Recently noticing a carrying-case that seemed to differ from the usual type, I asked the designer, Mr. G. H. Dickinson, of the Sutton Model Engineering Club, if I might describe it in THE MODEL ENGINEER, and he gladly agreed.

The case in question is illustrated in photos Nos. 1 and 2, but I would point out that, at the time it was built, decent timber was even more difficult to obtain than it is now; and so Mr. Dickinson had to use [redacted] old blackout shutter for the purpose, and the [redacted] has not the finish he would like it to have.

The two main advantages over most other cases is that, first the cover can be quickly removed by withdrawing two bolts only, and these bolts are in full view of the operator the whole time they are being inserted so that there is no blind hunting for [redacted] hole, and, secondly, the case itself, or [redacted] least its woodwork, carries no weight at all, so that the timbers of which it is constructed need only be strong enough to stand up against exterior forces.

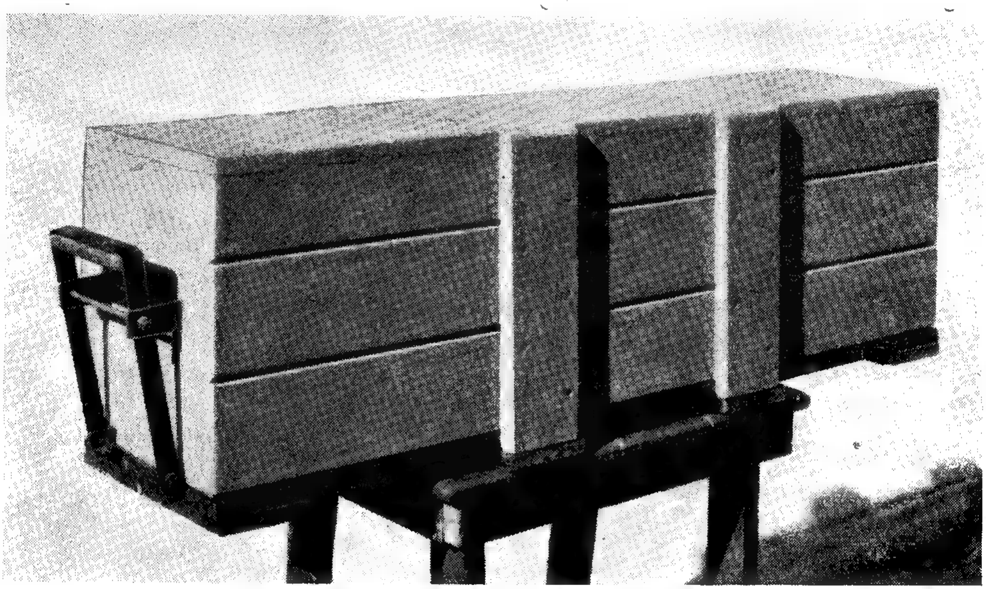


Photo. No. 1. The carrying case closed

Referring to Fig. 1, it will be seen that the case consists of a wooden base, say, $\frac{3}{4}$ in. thick, to which is screwed two parallel lengths of angle-iron, say, 1 in. $\times$ 1 in. $\times$ $\frac{1}{8}$ in. No. 6 $\times$ $\frac{5}{8}$-in. countersunk wood screws at 4 in. centres should be sufficient for the job.

The angle-iron projects about one inch beyond the end of the baseboard, and a $\frac{1}{4}$ in. clearance hole is drilled through this projecting portion. The handles consist of $\frac{7}{8}$-in. $\times$ $\frac{1}{8}$-in. mild-steel strip bent as shown. These handles have $\frac{1}{4}$-in. clearance holes drilled in the ends, and similar holes drilled about 6 in. up. A half-round wooden grip is fixed on the inside of the top by means of two wood screws.

The lid consists of [redacted] five-sided box, and the method of construction will depend on the capabilities of the maker; but that shown in

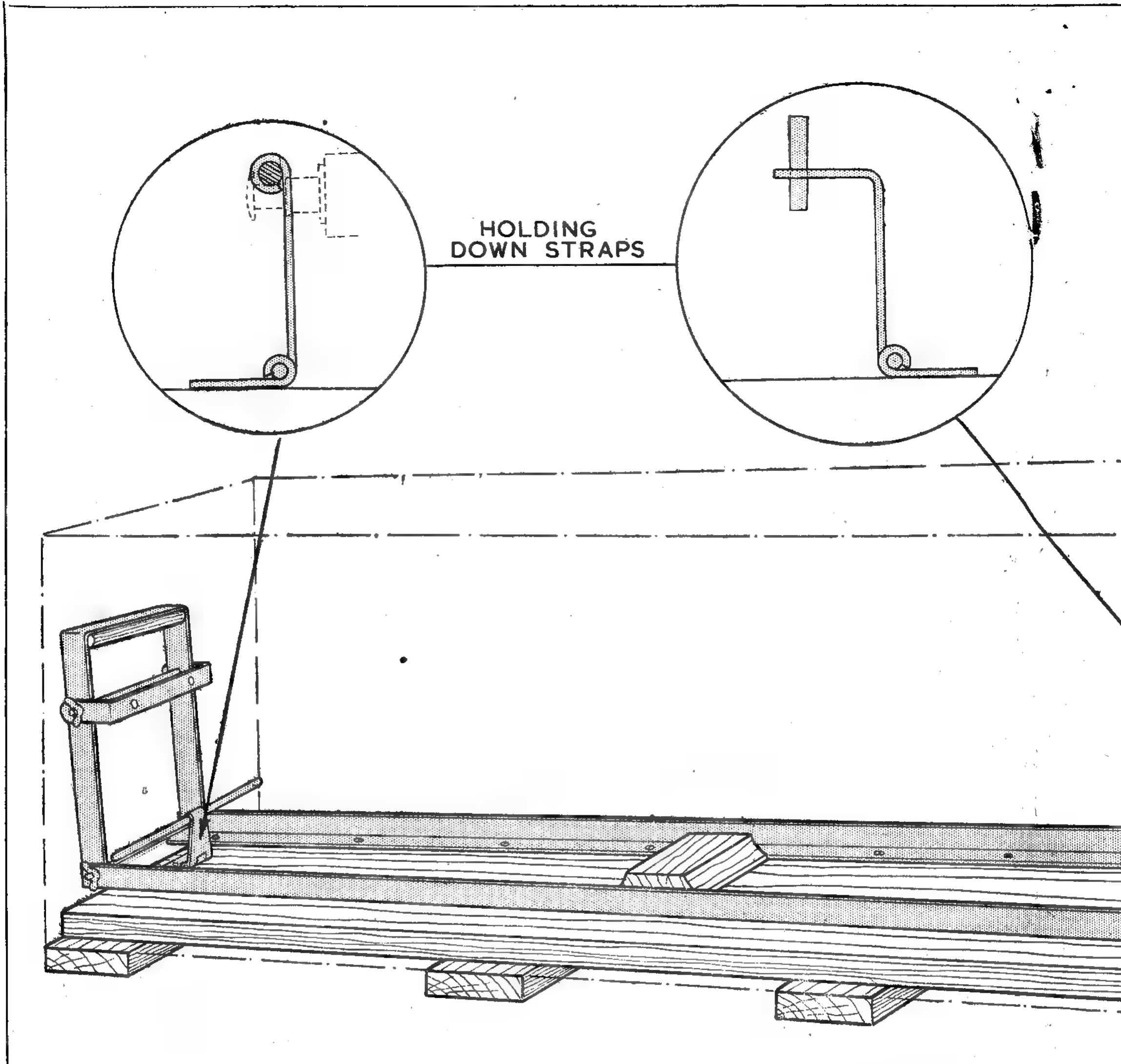
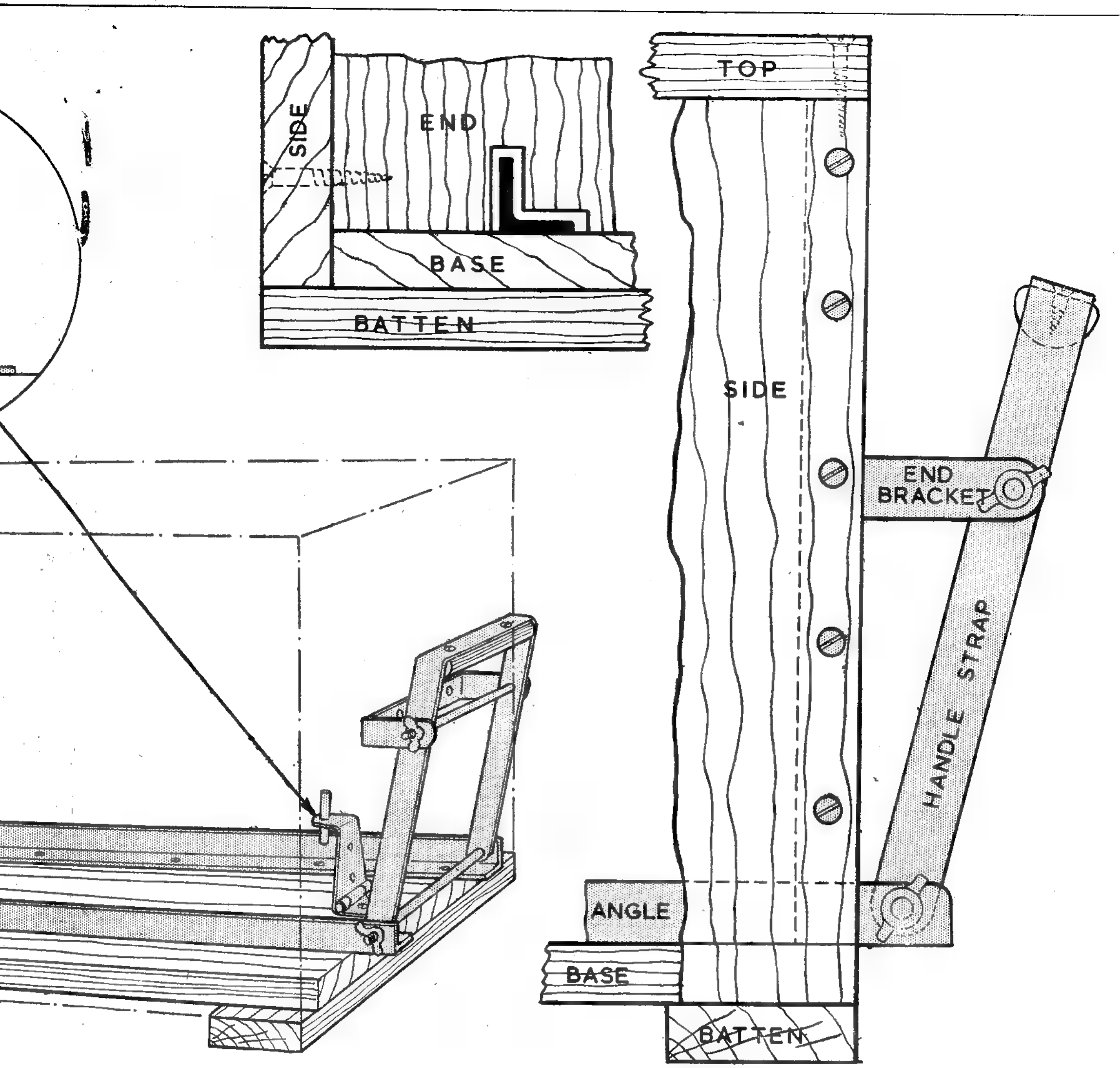


Fig. 1. Showing construction of cases f

the drawing is both simple and strong. The end-pieces are shorter in depth than the sides by an amount equal to the thickness of the base-board, and the bottom edges are cut away to clear the angle-irons. A U-shaped strip of the [illegible] metal [illegible] the handle is fixed to the ends, and $\frac{1}{4}$-in. clearance holes are drilled in it, coincident with those in the handle. Four long bolts are then obtained and these should preferably have wing or knurled nuts, and are used to secure the handles to the angle-irons and the brackets on the ends.

It will be seen from the drawing that by removing one of these bolts from each end, the cover can be lifted off; usually, it is preferable that the top bolt is removed so that the handles are still attached to the base after the cover is removed, and then can still be used for carrying the locomotive around. A point worth noticing here is that the engine is quite accessible after the cover is removed, as there are no sides to get in the way.

The wheels of the locomotive rest on the inside edge of the horizontal portion of the angle-iron, which should just clear the flanges, and the distance apart of these will depend on the



...ruction of cases for gauges up to 3½ in.

gauge of engine that it is designed to hold.

To hold the engine down, two strap hinges are used; at the forward end the hinge strap is shortened, and the end then bent to form a sleeve through which a ¼-in. steel rod will pass; this rod is cut to a length about one inch shorter than the width of the inside of the case. The height of the sleeve formed on the hinge should be such that, with the locomotive compressed on its springs, the steel rod will just pass over the buffers, as shown in detail drawing.

The rear strap hinge has the end bent over at such a height that this portion will pass into the drawbar slot of the loco when the springs are compressed, and is held in position by the drawbar bolt which passes through a hole drilled for this purpose in the bent end of the strap hinge.

A chock is fitted between the angle-irons and shaped to fit between two of the driving wheels, as shown in the drawing; this block should be screwed permanently to the base. A good coat of paint completes the job.

The case illustrated was designed by Mr. Dickinson for a 3½-in gauge job, but with some small modifications the same design can be used for larger gauges. The first difference will be

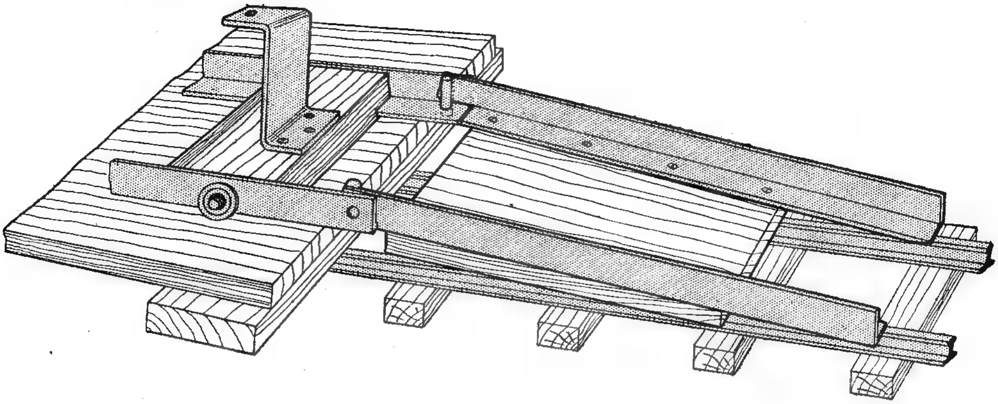


Fig. 2. Showing the ramp, detachable anti-roll chock, and rear holding-down strap

the necessity to make provision for [redacted] ramp so that the loco can be rolled straight off the track into the case, and so I have drawn out a design for such [redacted] ramp (see Fig. 2). As will be seen from the drawing, it consists of two short lengths of angle-iron screwed to [redacted] block of wood, and spaced so that they are at the correct gauge apart. At the " case " end of the angle-irons, a steel pin is brazed or welded to them and these pins drop into holes drilled into the ends of the angle-irons of the case. As the irons forming the ramp lie on the inside of those of the case, an amount equal to the thickness of the web must be filed off the horizontal web in order to bring them to the correct gauge, and they should also be filed to [redacted] chamfer where they meet the track.

The central anti-roll chock fitted to the smaller case cannot now be used; instead, blocks [redacted] fitted at either end, and these may be made detachable [redacted] shown in the drawing, a long bolt

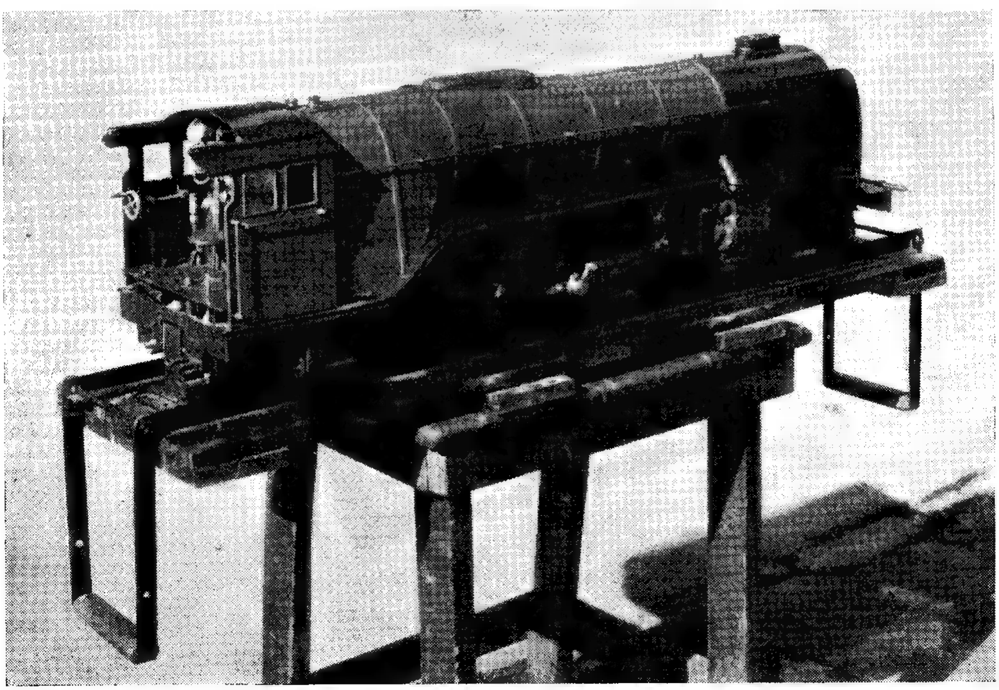
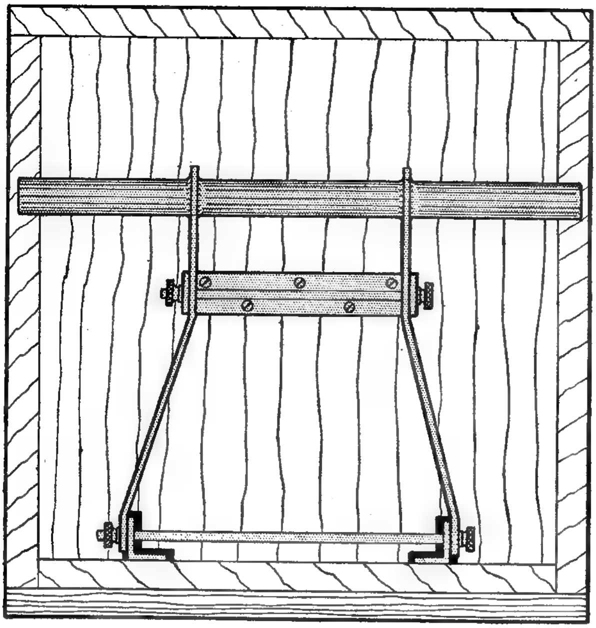


Photo. No. 2. The carrying case opened



passing through the angle-irons and right through the blocks. The normal strap hinge would not be strong enough to hold the heavier models down, and an alternative arrangement is shown in the drawing.

The design of the handles will also have to be altered, [redacted] at least four men will be required to carry the larger-gauge locos, and [redacted] alternative type of handle is shown in Fig. 3.

No dimensions have been given, [redacted] these must obviously depend on the type and gauge of locomotive for which the case is required; this will also apply to the size of angle-iron required, and to the weight of metal used in the construction of the handles.

Left—Fig. 3. The strengthened and larger handle for larger-gauge locos

---

For the Bookshelf

Model Glow Plug Engines, by C. E. Bowden. (London: Percival Marshall & Co. Ltd.) Price 3s. 6d. net.

For many years, all small high-speed internal combustion engines had to rely upon electric spark ignition, and this factor often hampered or seriously limited their application in certain classes, especially where bulk and weight were of the utmost importance. Despite many improvements in miniature ignition equipment, the possibilities of very tiny engines which could work without this aid have enabled their scope to be greatly increased in the model sphere. The compression-ignition engine has its own particular virtues and limitations, but many of the latter are overcome or reduced by the glow plug, which may be regarded [redacted] a link between the "ignitionless" engine and the more normal engine requiring constant supply of high-tension current. To meet the demand for information on engines intended specifically for use with glow plugs, our popular author, Col. Bowden, has produced this book, which deals with the various applications of such engines, and describes many types of commercial engines employing glow plug ignition.

Watch Escapements, by Dr. James C. Pellaton. (London: N.A.G. Press Ltd., 226, Latymer Court, W.6.) Price 10s. 6d. net.

Those who study horology in any of its forms [redacted] aware of the importance of both design and accurate workmanship in all timekeeping mechanisms, and most of all, in escapements; reliability, long life and precision timekeeping all depend [redacted] the excellence of the work put into this component. The author of this book [redacted] formerly [redacted] director of the school of horology at La Locle, and it has been used for some years as [redacted] text book in Swiss horological schools. It has now been translated by S. Paris and D. de Carle, and should be equally valuable to British horological students. The minuteness of watch escapements makes it difficult to explain their characteristics either by demonstration or illustration, but this difficulty has been dealt with by making drawings of them enlarged to 20 diameters, and in some cases even more. There are 269 line drawings of escapements and their details in the book, which must surely be one of the most comprehensive and up-to-date works on the subject ever written.

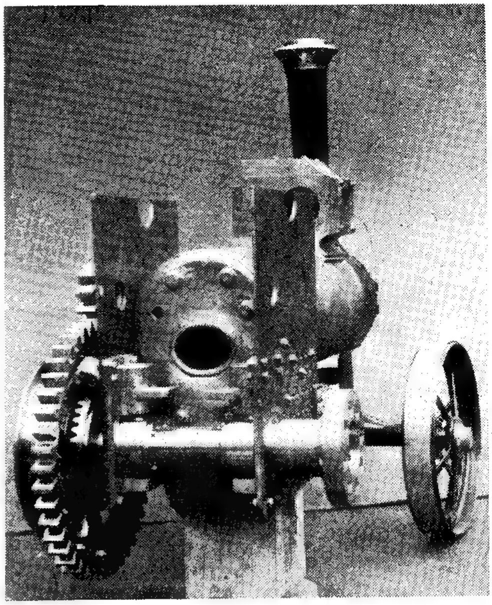
Simple Electrical Experiments, by C. E. Page. (London: Percival Marshall & Co. Ltd.) Price 3s. net.

It is slowly but surely becoming recognised that the quickest and surest way to acquire knowledge in any subject is by practical experiment. The student of electricity will find [redacted] welcome change from the theoretical textbook in this modest little book, which describes a large number of experiments, of [redacted] simple but progressive nature, in which the physical laws on which all electrical science is founded [redacted] demonstrated clearly and convincingly. Even if used only for recreation and amusement, these experiments are worth while, but their educational value is still greater, and should not be despised even by the most serious seeker after knowledge.

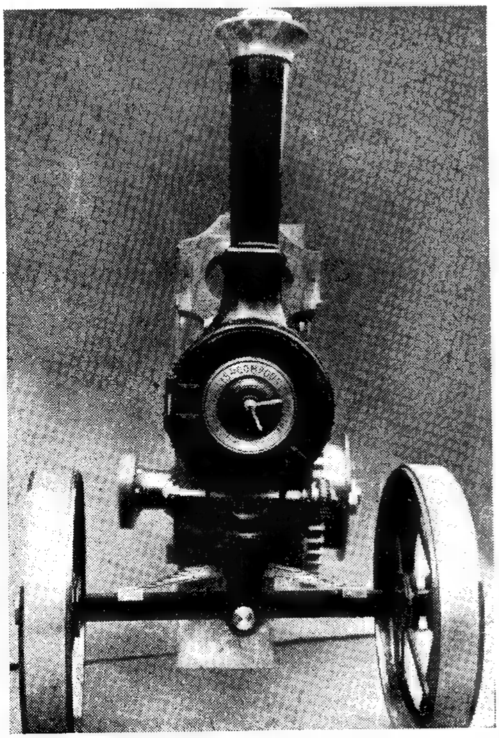
A Model Wallis & Steevens Road Locomotive

by "Bro. Two Dollars"

QUITE a few of my old friends were very interested when they learned that I had started to build one of these road locomotives; as a matter of fact I have had the ambition to build and run one for very many years, but I have left it rather late owing to interruptions due to the war, and other incidents which have conspired to upset my plans. I have seen models, good, bad and indifferent, of nearly all well-known makes of road locomotives, so I decided to build one that I cannot remember ever having seen in model form. I determined also that my efforts should not be spoiled for the want of care in ensuring accuracy, though this has entailed a good many delays in securing information so as to get details as faithful as possible. The 8 h.p. compounds of Wallis & Steevens Ltd., Basingstoke, seemed to me to suit my ideas, so I wrote to the makers, who very kindly sent me a 1½-in. scale general arrangement drawing, and as soon as I saw it I decided that this was the most suitable scale to give all the power required without too much weight.



Showing assembly of rear axle components



Front end, showing assembly of smokebox, axle, wheels and springs

The overall sizes are approximately 26 in. long, 12½ in. wide, 17⅝ in. high to top of chimney, with driving wheels 9¾ in. diameter and front wheels 6¾ in. diameter and boiler barrel 4 in. diameter. As a result of a mention of my enterprise in THE MODEL ENGINEER, I received quite a number of enquiries, and several orders for complete engines, provided that they could be supplied in six to nine months—that is over two years ago! I sent out leaflets to say what I was doing and informed prospective builders that, after I had got rid of the snags and made the final drawings, supplies for the model would be available.

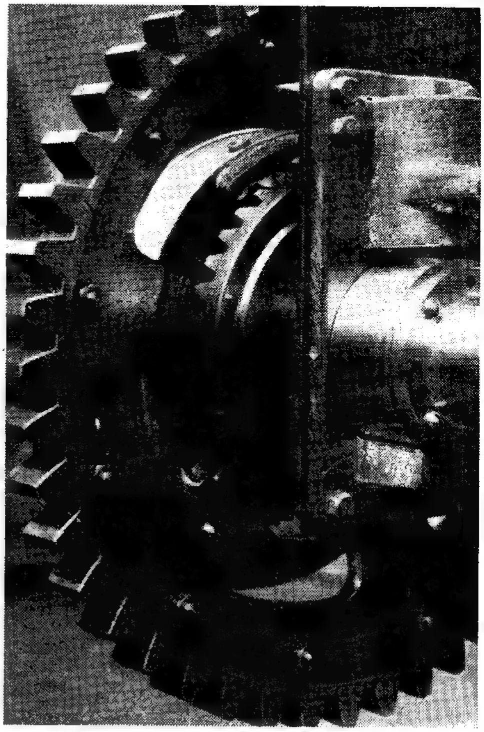
One of the most difficult items in the construction of the model was the compensating or differential gear, because I had to design it so that it could be made with the average model engineer's equipment. The photographs show the gear in almost finished condition. The cutting of the gear wheels was a major problem, as I had not the equipment available for this operation, so having ascertained how many sets of wheels were likely to be required I found a firm who undertook to cut the whole lot at a reasonable price. I had also decided to have the 3-speed spur gears cut on one blank, as this could be done on the equipment which the particular

firm had available, namely Parkinson & Fellowes' gear shapers. This enables the gearing to be made much lighter and neater than using separate gears.

Another big headache was the design of the driving wheels, as any casting anywhere near scale proportion would not be strong enough to hold its shape while machining, so I copied the full-size loco and made the inner rim and two outer rims in one piece, instead of several segments. These are correct to scale and are extremely light and strong. The spokes are of steel, and are cast into cast-iron hubs on the full-size locos, so I made the bosses in three parts, so that the spokes can be let into the hubs, caps fitted and all riveted together with copper rivets.

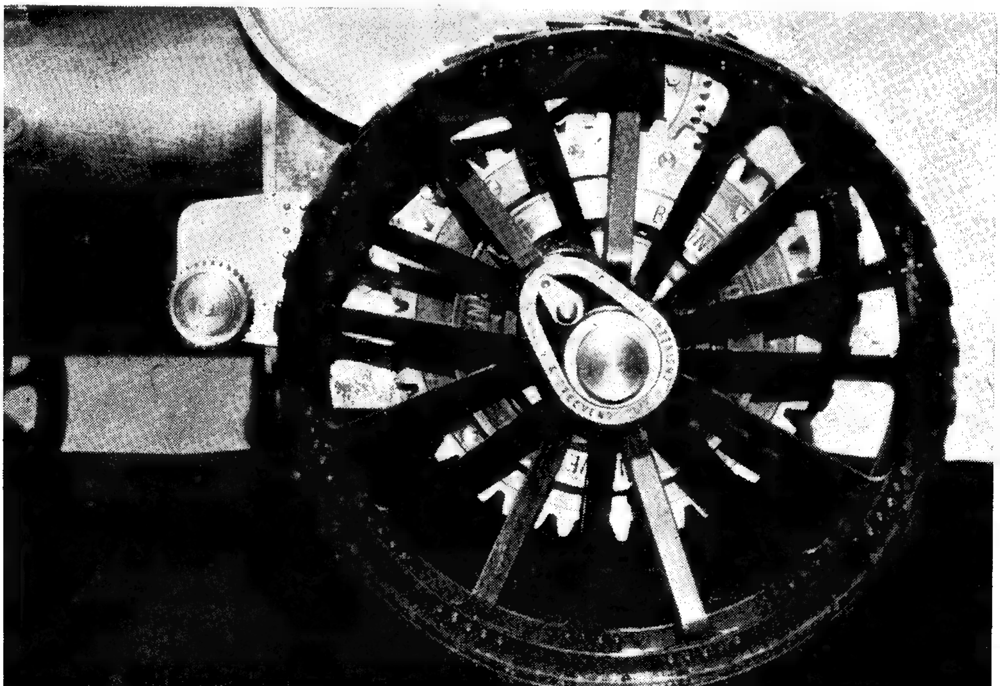
I made a building-jig for both the front wheels and the driving wheels, having a boss in the centre with a mandrel to hold the hub true. Four angle-irons were fitted at the correct radius, as measured by dial indicator, so that the boss and the rims could not move while the spokes were fitted. As a further precaution, I left all the bosses for both sets of wheels $\frac{1}{16}$ in. undersize, and after building and riveting up, the rim was set true in the chuck and rebored to correct size.

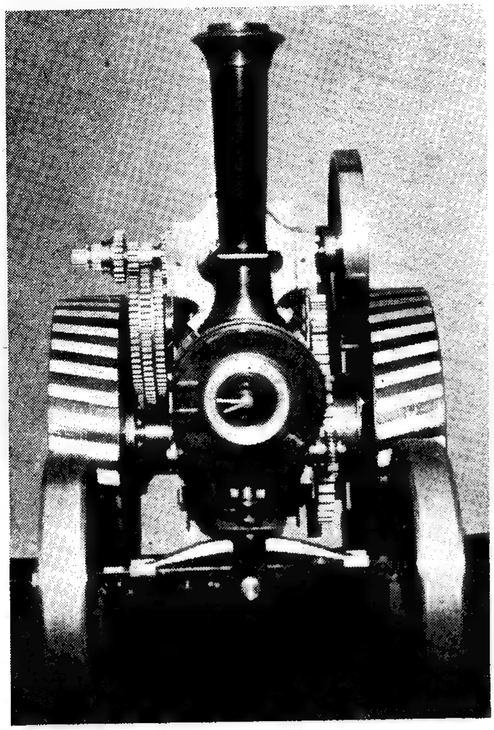
A snag arose in handling the driving wheels, which were $9\frac{3}{4}$ in. diameter while my faceplate



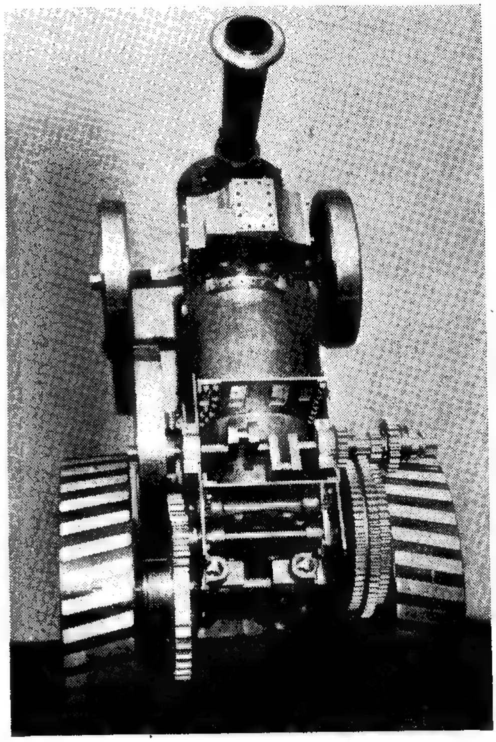
Right—Close-up of compensating gear, two crown wheels and three pinions

Below—Showing built-up driving wheel and worm steering gear wheel





Front end view of gearing and driving wheels



Showing built-up crankshaft, gears, splines and rear wheels

is only $8\frac{3}{4}$ in. diameter, so I fastened four plates to the faceplate, extending beyond the edge so as to just swing in the gap of the lathe bed. When the wheels were set on the faceplate, I was surprised to find that they ran true within 10/1,000 in.

The cylinders are $\frac{3}{4}$ in. and $1\frac{5}{16}$ in. bore and are attached to a platform mounted on the boiler barrel. The crankshaft is $\frac{3}{4}$ in. throw, and has six splines machined on it for the sliding pinions. The flywheel is $6\frac{3}{4}$ in. diameter. A good deal of the valve-gear has been completed, everything is made in jigs to ensure accuracy. The connecting-rods will be of the strap type, with two gibs and one cotter, and long adjusting screw, as on the full-size machine.

Photographs are supplied to all builders for instructional and assembly purposes, along with detailed drawings, the required castings and materials for that particular section.

The construction is still a good way from completion, and is held up at present by other very urgent work, but sufficient work has been done to give a very good indication of what the finished model will be like. What with my own model work and the work I undertake for my many friends and clients, I am kept pretty busy, and my usual working day is about sixteen hours, but I thoroughly enjoy it, even at over three score years.

Ramsgate's Second Exhibition

We hear from Mr. E. Church that the Ramsgate and District Model Club held its second exhibition recently, at Chatham House School, Ramsgate, and that it greatly excelled the first one, held last year. With the help of models lent by the North London Society of Model Engineers and the Faversham Model Club, the scope and interest were widened.

One fascinating feature was an exhibit consisting of two model racing cars with electrotor drive, so arranged that the cars started up and ran round a pole for three minutes, then stopped for ten minutes and repeated the process, time after time, without any attention.

There was a profusion of stationary engines of various types, some of which were in steam during the show. The club's lathe and drilling-machines were being operated by members.

A large number of locomotives, ranging from 16.5-mm. to 5-in. gauge proved to be one of the chief features of interest, and a very fully detailed "OO"-gauge model railway, covering an area 16 ft. by 8 ft. may be best described as the centre-piece of the exhibition.

IN THE WORKSHOP

by "Duplex"

*41—Gear-cutting in the Lathe

THE next step is to make the form tools required for machining the flanks of the gear-cutter teeth to the correct profile.

An illustration of one of these tools was given in Fig. 3 on page 740 of the June 16th issue, and three examples are shown in the photograph in Fig. 25.

The dimensional data for the diameter of the cutting pins and the centre distances at which they are spaced have been set out in the Tables; and with this in mind it remains to describe the actual methods used to make the complete cutting tools.

Originally, the tool was designed with [redacted] solid shank in which the cutting pins were made [redacted] force fit. This mode of construction, however, rendered the resharpening of the pins a somewhat difficult matter where [redacted] special cutter grinder [redacted] not available. To overcome this difficulty, it [redacted] decided to make the pins readily removable, so that not only could they be sharpened in [redacted] ordinary grinder, but, in addition, the pins could be rotated when in place in order to set their rake angle correctly. The latter form of tool shank will be seen in the central tool in Fig. 25 as well [redacted] in the working drawings in Fig. 26; its method of construction, however, also applies in all essentials to the making of the simpler solid form of tool shank.

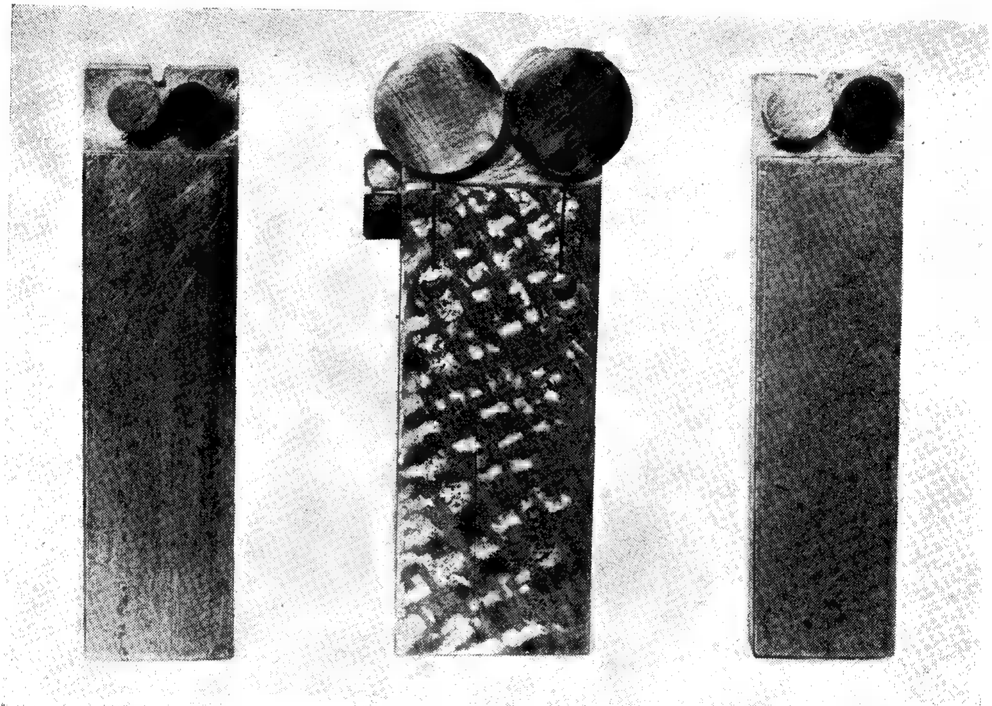


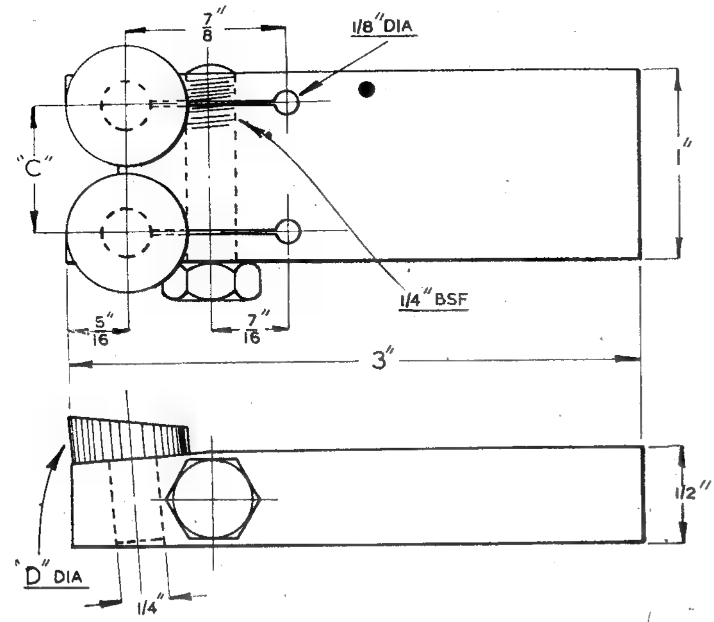
Fig. 25. The form tools used for machining gear-cutters

The dimensions of the material used for the shank will depend both on the size of the pins fitted and on the overall height available in the lathe tool-holder, but maximum dimensions are advisable to facilitate the machining, [redacted] well as the cutter grinding operations.

The first step is to machine, or file and scrape, the under surface of the material flat; the work is then mounted horizontally in the vice attached to the vertical milling slide, and the slide [redacted] a whole is set at an angle of 5 deg. across the lathe axis. This setting enables the angular flat, shown in Fig. 27A, to be machined at the end of the shank by means of either [redacted] circular milling-cutter or a fly-cutter.

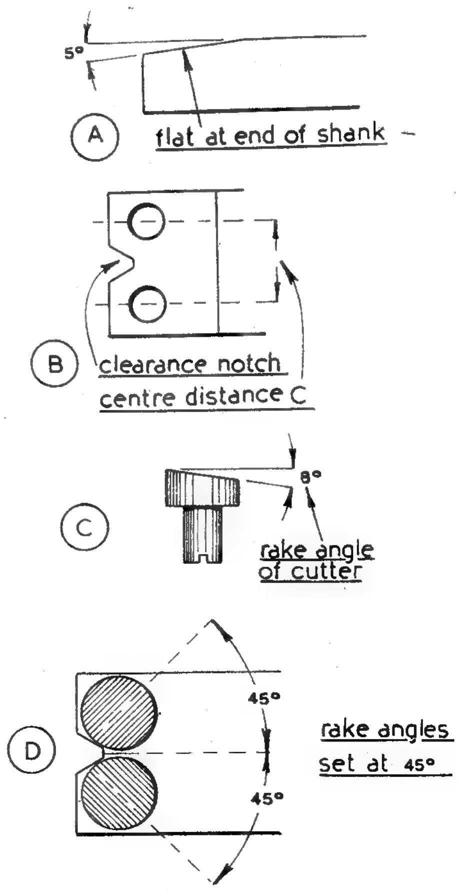
---

*Continued from page 801, Vol. 100, "M.E.," June 30, 1949.



Left—Fig 26. Form tool fitted with a clamp-bolt

Below—Fig. 27. Details of the form tool



Without removing the work from the lathe, the positions of the two holes to receive the cutter pins are marked-out approximately. A small Slocomb drill is gripped in the lathe chuck, and its point is brought against the marked-out centre of one of the holes by adjusting the setting of the cross-slide and the vertical-slide. The cross-slide and the vertical-slide are then locked, and the index of the vertical-slide is set to zero and locked in this position. In this way, the first hole is centre-drilled, drilled and finally reamed to size. The position of the second hole is determined by moving the vertical-slide, with the aid of its index, for a distance equal to the dimension given in the Table and indicated in Fig. 27B. After the slide has again been locked, the second hole is machined in a similar manner to the first. The work can now be removed from the lathe and the position of the cross clamping-bolt is marked-out and then drilled and threaded. The two saw slots shown in the drawing should next be marked-out and $\frac{1}{8}$ in. diameter holes drilled at their inner extremities right through the shank.

The slots may be cut by using a hacksaw blade of $\frac{1}{4}$ in. width threaded through the cutter hole and then secured in the hacksaw frame, but where the diameter of this hole is less than $\frac{1}{4}$ in., a narrow piercing saw blade must be employed for this purpose. To complete the work on the tool shank, a V-notch, as shown in Fig. 27B, is filed in its end to afford clearance for the cutter teeth when the tool is in operation.

The cutter pins, at one and the same setting in the chuck, have their shanks turned to a good fit in the tool shank, and their heads machined to the exact diameter given in the Table.

In order to facilitate rotating the cutter in the tool shank when setting the direction of its rake, a screwdriver slot is cut with a fine hacksaw at the end of the cutter shank.

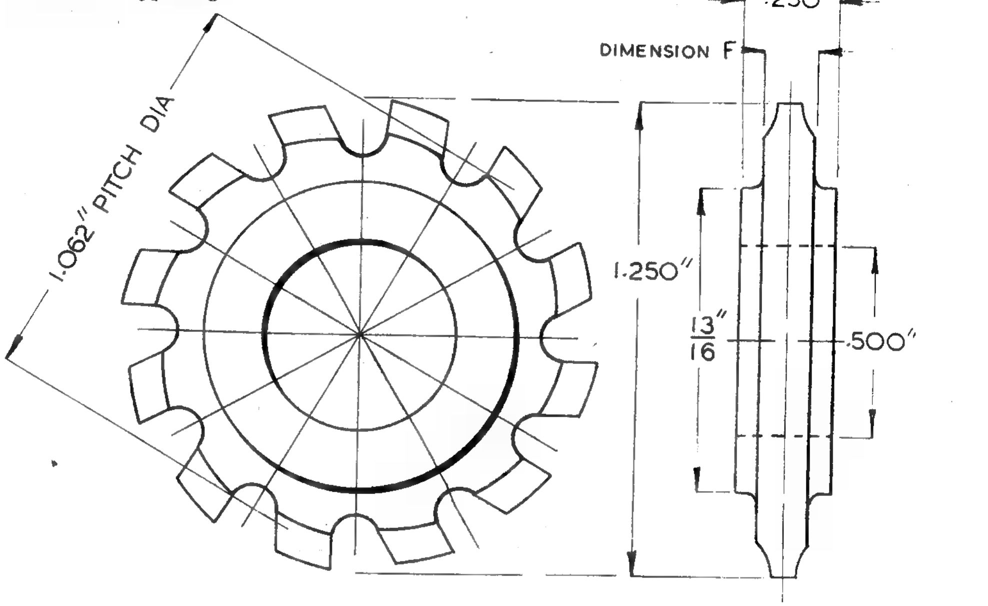
Either silver-steel or ordinary carbon tool-steel may be used for making the cutter pins, and after machining they are hardened and then tempered to a straw colour.

The final operation is to sharpen the tool by grinding the correct rake angle on the upper surface of the cutter pins, and then finishing the cutting edges with an oilstone slip.

Now, a rake angle of 5 deg. is required to offset the inclination given to the end of the the lathe axis; the rake angle can then be machined by taking a cut with a milling-cutter or a fly-cutter across the surface of both pins.

To ensure ready identification, it is advisable to mark the tool shank with its diametral pitch, pressure angle and tooth number. This can be done with hand punches, but if preferred, these particulars can be etched on the tool by the method to be described later for marking hardened gear-cutters.

Fig. 28. A typical gear-cutter



tool shank, but, as shown in Fig. 27C, this angle is increased to 8 deg. in order that when the cutter pins are finally rotated, as illustrated in Fig. 27D, a small amount of top rake remains in the direction of the tool's line of cut.

To grind this 8 deg. rake, the cutter pins are clamped one at a time in the tool shank, and when the angular rest of the grinding machine has been set to 8 deg. the upper surface of the tool can be accurately ground without difficulty.

Should the tool shank have any tendency to rock on the grinding table, this may be overcome either by gripping the shank in a small vice or by clamping it to a suitable angle plate.

When the upper faces of the cutter have been ground in this way so as to leave them equal in height, the shanks are inserted in the tool and then turned with a screwdriver to align the rake angle at an angle of 45 deg. with the long axis of the tool shank, as illustrated in Fig. 27D. The cutters are finally secured in place by tightening the clamp-bolt and the tool is ready for use.

Where the cutter pins are of large diameter entailing the removal of much metal to form the rake angle, this operation will be facilitated if the tool shank, with the unhardened cutter pins secured in place, is mounted on the vertical slide set at an angle of 8 deg. across the line of

Machining the Cutter Blank

Now that the construction of the cutter machining attachment has been described, together with the making of the various tools and jigs required, the next step is to consider in detail the machining of the gear-cutter itself

The material used for making the cutters is round, tool steel bar, although for machining brass and aluminium gear wheels some workers find that case-hardened mild-steel cutters give satisfactory results if care is taken. However, as the labour expended in making cutters of these two materials does not differ materially, it is on the whole wisest, perhaps, to adhere to carbon steel for this purpose.

The form of a typical cutter is shown in Fig. 28, and it will be observed that the cutter has twelve teeth with an overall diameter of exactly $1\frac{1}{4}$ in. The pitch diameter indicated in the drawing refers to the holes drilled to form the bases of the teeth and not to the pitch circle of the teeth.

To provide an actual example, referred to throughout the machining operations that follow, the making of a gear wheel having 30 teeth of 40 diametral pitch and with a pressure angle of 20 deg. will be described. To obtain the data necessary for the machining operations, reference should be made to Table A given previously.

The operational drawings in Fig. 29, A to H,

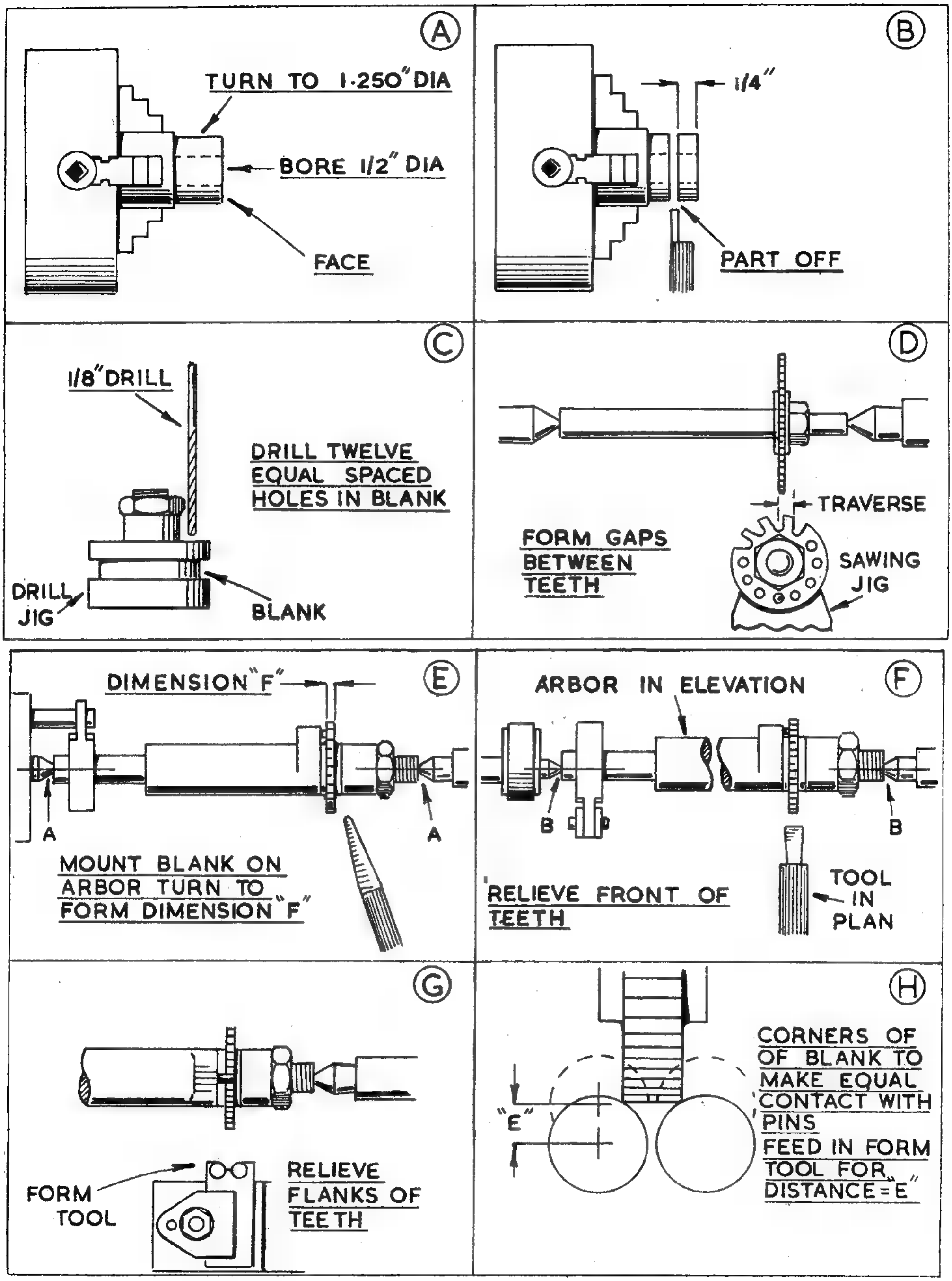


Fig. 29.

represent the machining sequence step by step.

The material is gripped in the lathe chuck (A), and its end is faced; the outside diameter is then finish-turned to exactly 1.250 in. The bore is next machined to ½ in. diameter to afford a close sliding fit on the eccentric end of the cutter arbor. The latter operation may be carried out either by boring to a fine finish, or by boring slightly under-size and then correcting with a reamer. If several cutters have to be

made, time will be saved and uniformity will be ensured if an adjustable reamer of the type illustrated in Fig. 30 is employed, for when once this tool has been correctly set it may be used to finish all the bores accurately to size.

It should, perhaps, be pointed out that this form of reamer, being of American manufacture, is not always easily obtainable, but the more usual pattern with a much wider range of adjustment may be used instead.

order that the cutter teeth may be formed centrally; this allows the clamping faces of the cutter to be used as datum surfaces, when at a later stage the cutter is set centrally in relation to the gear-wheel blank.

Half the surplus metal is, therefore, removed from one side face, with the aid of a micrometer measurement, and, when the cutter has been reversed on the arbor, the remainder can be faced off with reference to the leadscrew index.

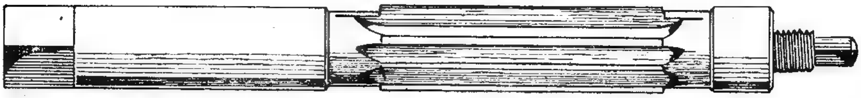


Fig. 30.

Next, as represented in B, part off the blank to ¼ in. width. The inner face of the blank can be turned to a good finish if the parting-tool, when it has reached to within about 3/32 in. of the bore, is withdrawn and then traversed a thousandth of an inch to the right in order to give a light facing cut; the parting-off operation is then completed. As an alternative, the blank can be mounted on a shouldered stub mandrel for facing the back surface.

The blank is now clamped in the drilling jig (C), and the twelve equally-spaced holes to locate the cutter teeth are drilled with an ⅛ in. diameter drill. After taking the blank out of the jig, carefully remove the drilling burrs with the aid of a countersink or centre drill turned with the fingers, and as an additional precaution, rub the work on the surface plate to make sure that no high spots remain; should any bright spots show up, they can be levelled by using a small flat-ended scraper.

The cutter is now clamped in the sawing jig to enable the gaps between the teeth to be formed. This is carried out, as shown in D, with a slitting saw mounted on a mandrel between the lathe centres, while the jig itself is secured in the tool-post to lie parallel with the sides of the saw.

A fairly thick saw should be used for this purpose to prevent it being deflected from its true path. The work is aligned by means of the top slide to ensure that the saw cut meets the drilled hole almost at its extreme edge. The sawing operation is continued tooth by tooth until the blank has been slit all round in this manner; the top slide is then traversed, as indicated in the drawing, to bring the saw into line with the edge of the following drilled hole, thus enabling the machining of the tooth gaps to be completed and the teeth themselves to be formed with parallel sides. The saw-cut surfaces on the leading edges of the teeth should be carefully cleaned up with a fine file while the blank is gripped in the vice.

The thinned portion at the periphery of the blank, indicated in Fig. 28 and other drawings by the dimension F, is machined as shown in Fig. 29E. The cutter is secured against the shoulder of a true-running mandrel, or the cutter arbor itself can be used when mounted on its centres AA; the surplus metal is then removed with a round-nosed tool.

It is essential to remove an equal amount of metal from the two side faces of the blank in

The dimension F, will, of course, vary with the diametral pitch of the cutter; in the present instance, as the D.P. is 40, the figure 4.00, given in Table A, must be divided by 40, leaving a thickness of 0.100 in. This dimension must be observed exactly, as it is a datum figure, and on it will depend the accuracy of the tooth form of both the cutter and the gear teeth it eventually machines.

This completes the preliminary machining operations on the cutter blank, and it now remains to cut the teeth to their correct form and, at the same time, to afford them the necessary relief.

For this purpose, as depicted in F, and in the photograph in Fig. 6 (June 16th issue), the cutter blank is mounted on the arbor of the relieving attachment and with the cutting face of the tooth nearest the operator pointing downwards. The arbor is mounted on its centres BB so that the cutter moves eccentrically when the arbor is turned. A square-ended lathe tool is secured in the lathe tool-post with its cutting edge at centre height.

The rocking arm attached to the mandrel end of the arbor is then adjusted, in accordance with Figs. 9 and 31, so that, as the lathe is turned by hand, the eccentric gear moves the cutter blank with the appropriate motion for relieving the teeth.

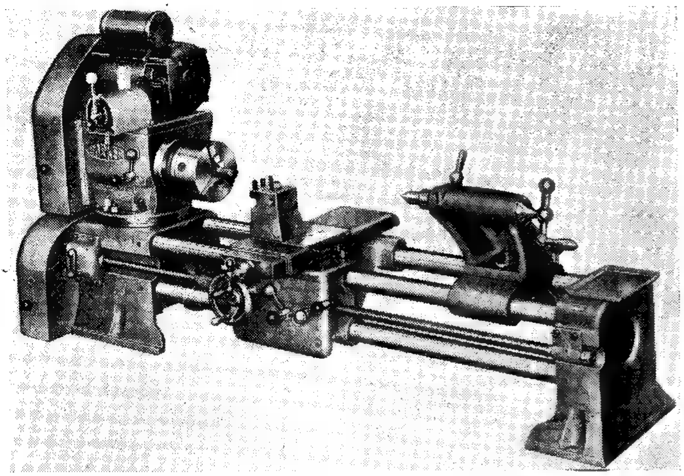
To set the eccentric gear correctly, reference should be made to Fig. 31 as well as to Fig. 9; these illustrations show that the rocking motion should be adjusted so that the upper face of the relieving tool is clear of the face of the tooth at the start of the cutting stroke, and at the end of the stroke the heel of the tooth is again clear of the tool. (Fig. 31 has unavoidably had to be omitted from this instalment, but will be included in the next.)

It should be noted that once the arbor rocking arm has been correctly adjusted, it can remain permanently set in this position.

The lathe can now be started to run at from 60 to 100 r.p.m., and the tool is carefully fed in for a distance just sufficient to relieve the whole of the front face of the tooth.

The blank is then moved on the arbor to register the next tooth against the locking pin, and the machining is continued until all the teeth have been equally relieved with reference to the cross-slide index.

(*To be continued*)



The Barker 5 in. triple-bar bed lathe

The Barker Lathe

WE have recently examined a new design of 5-in. lathe which embodies quite a number of unusual and ingenious features, including some of special interest to readers of this journal. When the specification of this lathe was first brought to our notice some months ago, we chose to reserve our judgment until we had an opportunity of seeing it actually demonstrated, in view of its sweeping departure from orthodox practice, which might possibly give rise to queries and criticisms; but having done so, we are satisfied that the special features of the design are well executed and successful in practice.

The most obvious feature of the design is the use of a triple-bar bed, and this also constitutes the most striking departure from standard lathe design. Bar beds have often been used in the past, mostly on the simpler types of lathes, sometimes a single bar, in other cases double or in conjunction with a prismatic guiding member; their success has varied, mainly in proportion to the excellence of detail design and accuracy. In the Barker lathe, the triple bar arrangement is more rigid than it looks, and the boring of the support seatings and sliding members is carried out by a special process which ensures precise parallel alignment. It is claimed that deflection of the bars cannot take place to any measurable extent, as in view of the rigid end supports and long sliding bearings, all three of the bars would simultaneously have to be cranked, not merely bowed. Tests of the lathe with heavy intermittent or eccentric cuts, under careful observation, have supported this contention.

Taper Turning

Another unusual feature is the swivelling headstock, which enables taper turning to be carried out without the necessity for using a swivelling top slide, though this fitting is available if required. The headstock is normally located by a close-fitting dowel for parallel turning, but by slackening the headstock bolts and removing the dowel, it can be swung through a maximum angle of 30 deg. either way, with no interference with drive or gearing.

The driving motor is mounted directly on the top of the headstock and drives by vee-belt on to a pulley concentric with the mandrel, to which it can be positively coupled to give a direct drive. Other speeds are obtained by uncoupling the pulley and driving by gears, which are readily changed, and the standard combinations available give a range of 7 speeds, from 66 to 550 r.p.m., or 110 to 1,030 r.p.m. It is, however, possible to extend the range of gearing to cover speeds up to 3,000 r.p.m., the highest speed at which the lathe is designed to run. Heavy duty Timken roller-bearings carry the mandrel, which is bored 1 in. diameter and tapered No. 4 Morse; chucks and faceplates are fitted to an external taper, with a bayonet device which can be positively locked. The tailstock has a $1\frac{1}{2}$-in. diameter barrel with No. 3 Morse taper socket, and is of the set-over type for long taper turning between centres.

Building-up

An interesting feature of the specification is that the lathe can be obtained in its simplest basic form, and built up by the addition of saddle and slide-rest, with or without swivelling top slide, screw-cutting gear, etc., and speed and feed ranges may also be similarly extended as and when desired. Should wear of the bed take place, the bar members can readily be replaced.

The main dimensions of the Barker lathe are as follows: Height of centres 5 in., swing over bed, 11 in. diameter, over saddle 7 in diameter; maximum length between centres 24 in., boring table on saddle, $5\frac{1}{4}$ in. by 5 in.; weight of complete lathe $3\frac{1}{2}$ cwt. without stand. A pedestal cabinet stand is available, or the lathe can be supplied in the form shown, for bench mounting. It is manufactured by Barker Machine Tools & Equipment Ltd., 156, Fulham Palace Road, London, W.6.

THE BOURNVILLE REGATTA

THE 24th Annual Regatta of the Bournville Model Yacht and Power Boat Club was held as usual at the Valley Pool, Bournville, on Whit-Monday. This event proved to be one of the biggest regattas ever held in the Midlands, as a fine representation of boats in all racing classes were present besides a large number of steering boats.

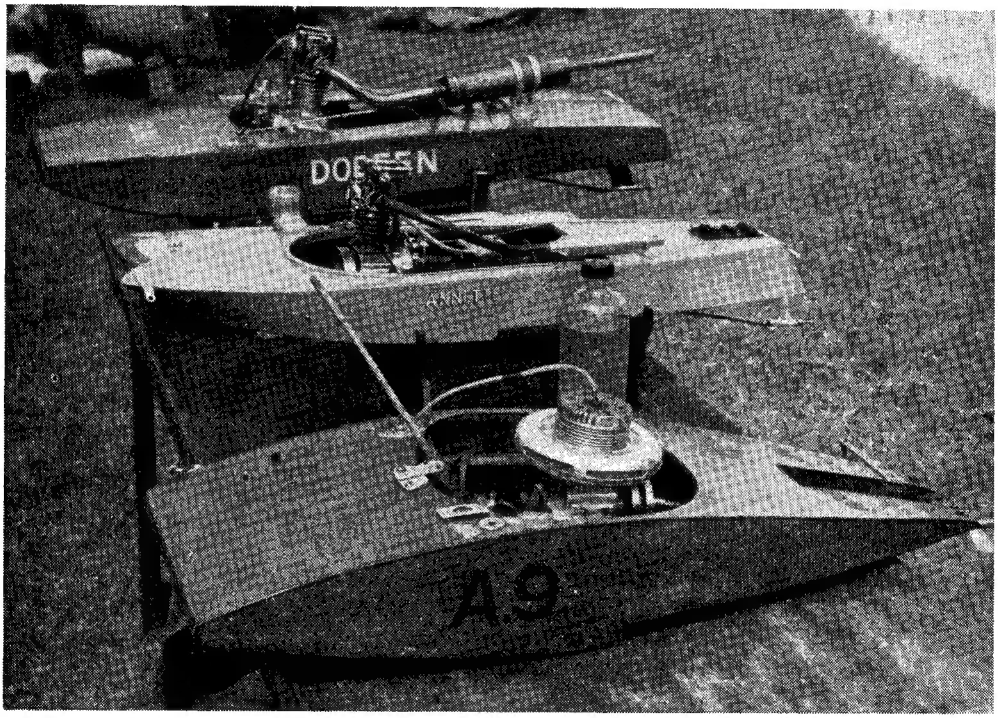
The clubs represented were Altrincham, Bournville, Blackheath, Coventry, Derby, Guildford, Orpington and Swindon.

The Regatta was declared open by Alderman Mrs. N. Hyde, of the Birmingham Parks Committee, and racing commenced with a 500 yd. race for " A " class hydroplanes, for the Coronation Trophy. Although some well-known craft were present, the " A " Class boats seemed reluctant to show their paces. Mr. Tompkinson's (Altrincham) boat *Rene* capsized on its first run when only requiring one lap to finish. Two good runs were put up by Mr. Williams's (Bournville) *Faro*, the second giving a speed of 44.25 m.p.h. Mr. Meageen (Altrincham) was present with a new " A " Class boat fitted with a fierce-looking two-stroke engine, but unfortunately it had to retire without running, due to engine trouble. An interesting flash-steamer by a home club member, Mr. C. Williams, failed to finish.

Result :

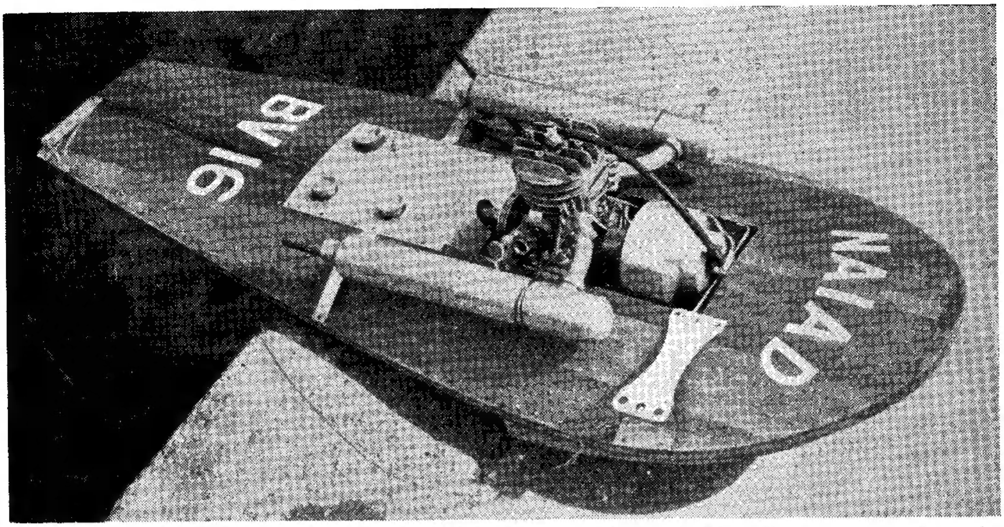
1st.—K. Williams (Bournville) *Faro*, 44.25 m.p.h.

2nd.—D. Harlow (Bournville) *Doreen*, 25.31 m.p.h.



" *Doreen* " (" *A* " *class*) *Bournville*, " *Annette* (" *B* " *class*), *Coventry. and* " *Samuel* ", (" *A* " *class*) *Altrincham.* (*Note the annular silencer fitted around the cylinder*)

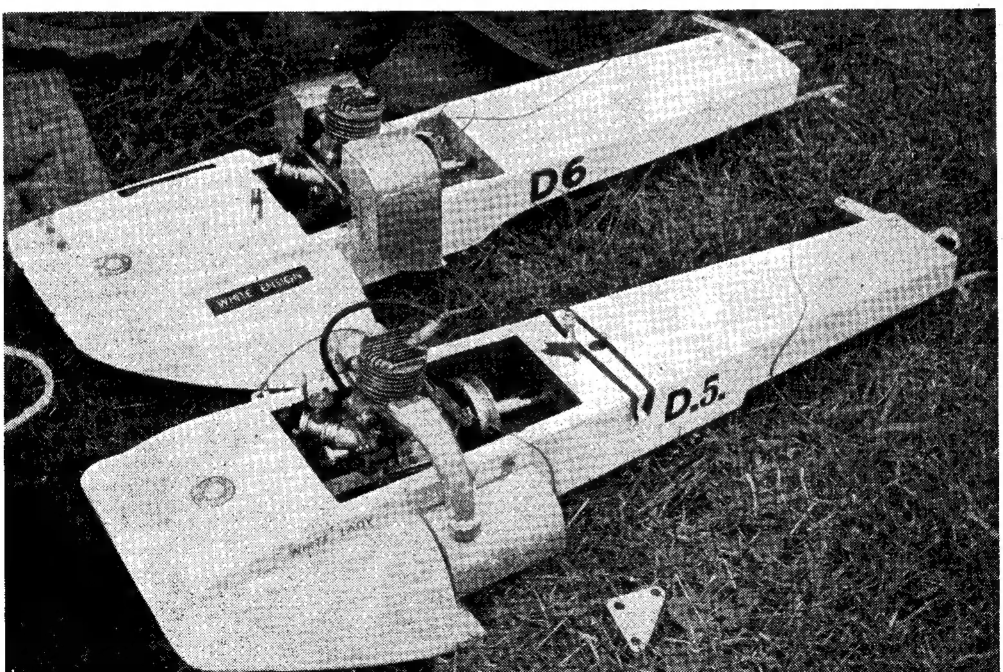
The 500 yd. race for " B " Class hydroplanes was the next event, the winner to hold the D. W. Collier Speed Trophy. This event produced 8 entries, but, due to various mishaps, only three or four succeeded in recording a complete run. Mr. F. Jutton's *Vesta*, which rarely fails to provide thrills, had a spectacular capsize on the first run, but had better luck when making the second attempt. The best performance was once again put up by Mr. R. Mitchell of Runcorn, the holder of the trophy. His 15 c.c. engined *Beta*, took first place with 23.2 secs., 44.1 m.p.h. Mr. Dalziel of Bournville had bad luck in this event when his beautifully streamlined hydroplane dived under and hit the bottom, causing some damage to the hull.



An interesting " B " class boat by Mr. T. Dalziel (Bournville) fitted with a flat-top two-stroke engine with flywheel magneto.

Result :
Mr. Mitchell (Runcorn) *Beta*, 44.15 m.p.h.
Mr. Jutton (Guildford) *Vesta*, 39.6 m.p.h.

The event for Class " C " hydroplanes produced quite a number of entries but not many " stayers," many boats failing to complete the distance. The Derby Club had several interesting craft in this race, including two examples of E. T. Westbury's Ensign two-stroke design *White Ensign* and *White Lady*. Some of the boats put up quite a fast speed for a few laps before " conking out," and the winner of the special Class " C " prize was C. Stanworth (Bournville), with *Meteor III*, 25.21 m.p.h.



Despite their colour, these two Derby " C " class boats, Mr. Jackson's " White Ensign," and Mr. Pym's " White Lady," are definitely dark horses !

Before the final event of the day, a fine demonstration of radio control of a small fast runabout launch was given by members of the home club. The boat was made to perform many evolutions, and it was interesting to note the instant response of the model to the signals sent.

The last event of a fine day's sport was a Steering Competition for the A. Hackett Steering Trophy, and this resulted in a larger entry than usual from both the home and visiting clubs. The targets which were fairly widely spaced provided the competitors with a comparatively easy course, and few boats failed to make a respectable score. Mr. Hood (Swindon) with *Truant* managed to score a maximum—three bulls—15 points, another Swindon boat, Mr. Kirkham's *Lady Windsor*, tied for second place. The steering boats of the home club also performed very well.

Results :

1st.—Mr. Hood (Swindon) *Truant*, 15 points.

2nd { Mr. Kirkham (Swindon) *Lady Windsor* .. 11 points
Mr. A. Rayman (Blackheath) *Yvonne* .. 11 points }

The various trophies and prizes were presented by Mrs. Picknell whose late husband was a prominent member of the Bournville Model Yacht and Power Boat Club for many years.

PRACTICAL LETTERS

"A Crimson Rambler"

DEAR SIR,—I was much interested in the delightful drawing and the accompanying note in your issue of June 9th, for I have always considered that these engines were amongst the most successful 4-4-0 engines ever built.

Your note would appear to contain a couple of errors relative to dimensions :

(1) The five engines built to Johnson's designs had L.P. cylinders of 26 in. stroke not 28, this can be confirmed by reference to Lake's *The World's Locomotives* (which contains a fine set of detailed drawings of these engines) and by Ahrons *British Steam Locomotive* 1825-1925, page 322, and by numerous other references, including the L.M.S. handbook.

(2) Fowler's original engines had cylinders H.P. 19¾ in. and L.P. 21¾ in. bore by 26 in. stroke but these sizes were quickly altered back to Johnson's original 19 in. and 21 in. bores. (Ahrons as above, page 323.)

Quite apart from the merits of the engine design, it is probable that the very large grate area, 28.4 sq. ft. contributed to their all-round efficiency and usefulness ; speaking without the book, I believe this was the largest grate area of any 4-4-0 engine in this country, only equalled by Deeley's ten "990" 4-4-0 simples on the same line.

Yours faithfully,

Harrow. K. N. HARRIS.

Appreciation

DEAR SIR,—This kind of letter is, no doubt, such a common occurrence with you that it is with much hesitation that I write it at all!

Nevertheless, I could not continue, week after week, to enjoy and greatly appreciate the splendid articles and drawings for the gear-cutting machine by your contributor, Mr. J. S. Eley, without conveying to you both how very much I value and appreciate the articles.

Outside of the medical and dental professions, I know of no other "fraternity" where the members are so ready and willing to contribute and pass on knowledge, "know-how" and technical skill, as are the members of the model engineering fraternity. What joy it is to learn so much and at the same time, have such a good time doing it!

All of which means simply, that only through the medium of THE MODEL ENGINEER is all of this possible, and I want to express again my thanks and appreciation to *all concerned* for all the pleasure and recreation I enjoy through the pages of THE MODEL ENGINEER.

With sincere thanks, appreciation, and very best wishes.

Meridian, Miss., U.S.A.

Yours faithfully,
DR. LEROY RUSH.

Experiences with Lathe Gearing

DEAR SIR,—It is probably not often that a lathe is tested "to destruction," but this, in a small way, happened to a Myford M.L.7 recently, when teeth from the bull wheel were broken. The surprise of, and some remarks made by, the agent from whom a new bull wheel was obtained, prompted this letter.

The agent stated that several would-be purchasers had commented upon the die-cast back gear wheel and pinion, and had doubted its strength and wearing qualities.

In the lathe in question, it was the cast-iron bull wheel which succumbed, though whether this was owing to the milling operation being carried out at the time being beyond the capacity of the lathe, or whether a piece of swarf jumped into the meshing wheels, is not certain.

Two 3-in. × $\frac{5}{16}$-in. face-cutters were being used to gang-mill steel sleepers for a 5-in. gauge railway, two slots being cut in one side of ½-in. × ½-in. × ⅛-in. angle iron. A 1/3-h.p., 230-volt motor operating on 200 volts was being used, and the belt was adjusted so that the motor could still rotate even if the mandrel were stopped. Backlash was reduced to a minimum by applying friction to the catchplate. An ominous noise from the region of the gears drew attention to the fact that one tooth of the bull wheel was entirely missing, and a second tooth was nearly off. A piece of swarf, similar to that being produced by the milling operation was found on the die-cast back gear pinion.

Two teeth of bright mild-steel were inserted in the bull wheel, and operations recommenced.

A third tooth broke soon afterwards. No swarf was discovered this time.

Three $\frac{1}{8}$-in. silver-steel pins were inserted in place of this tooth, and no further difficulty has been experienced, the same milling operation being continued. The new bull wheel has not yet been installed.

The above may be of interest in demonstrating that three consecutive teeth of the cast-iron bull wheel were destroyed—not the teeth of the die-cast pinion.

But there is evidence of the teeth of the die-cast pinion showing definite signs of wear, a distinct ridge being perceptible between the part of the teeth with which the bull wheel meshes and the unmeshed portion of the pinion teeth lying adjacent to the gear wheel.

The method of repair may be of interest.

The bull wheel was dismantled from the mandrel, and slotted across its face with a 3/32-in. slitting saw.

The slots were each undercut slightly towards the base of one side only with a warding file. The mild-steel bar used for the new teeth was $\frac{1}{8}$-in. wide and was carefully ground down to a tapered shape to be driven in lightly from one end of the slot. When in place, it was ground flush with the side of the bull wheel, and filed to proper tooth shape with a small warding file.

When the third tooth broke, there was insufficient cast-iron to make the same method possible. and so three holes were drilled and tapped $\frac{1}{8}$ in. in the bull wheel, and silver-steel pins screwed in and cut off. These were then filed to shape. There has been no trouble since.

The only difficulty experienced on reassembling the mandrel the first time, was with the hardened collar which holds the belt wheels in place, and which in turn bears against the thrust ball-race. The mandrel was very slightly reduced here to enable the collar to fit on a little more easily. It is still a very tight fit.

The teeth which were inserted by slotting make the better job, and did not take long to do, but the peg teeth were much easier, and appear to work at least as well.

Yours faithfully,

Melbourne. R. GRAEME ORR.

CLUB ANNOUNCEMENTS

Club Team Competition

Club secretaries are asked to send in their nominations of three competition entries for THE MODEL ENGINEER Exhibition Club Team Competition to the Exhibition Manager without delay. The club with the highest aggregate marks for the three nominated entries will be the winner of the Club Team Trophy which will be won outright.

Shrewsbury and District Society of Model and Experimental Engineers

The above society was formed in May, 1946, and has a membership of over 40. We meet on Monday evenings, 7-9 p.m., at the Technical College; our president is A. Moore, Principal of the College. We have the use of the very extensive workshops, including lathes, shaper, universal and vertical milling machines, $\frac{1}{2}$-in. capstan lathe, radial and pillar drilling machines, engraving machine, precision circular grinding machine fly-press, etc. In addition, both oxy-acetylene and electric welding equipment is available to members.

We held exhibitions in 1946 and 1947, supported by the Oswestry and Wrekin societies. Our exhibition this year will be in the Walker Hall of the college on Friday, October 28th, 7-9 p.m., and Saturday, October 29th, 2.30-9 p.m. Approximately 100 ft. of $2\frac{1}{2}$-in., $3\frac{1}{2}$ in. and 5-in. gauge track will be in operation. The exhibition is non-competitive, and entries are invited from all model engineers in the locality. The society is a member of the S.M.E.E. affiliation, and the support of the affiliation has also been promised.

Hon. Secretary: W. T. HOWARD, Technical College, Shrewsbury.

Edinburgh Society of Model Engineers

Through the courtesy of the Edinburgh Corporation Transport Department, a large party of members visited the workshops at Shrubhill on Wednesday, June 8th, and spent a most enjoyable evening.

This is the last outing until September 1st, when a visit is to be paid to the Corporation Gasworks at Granton, but members will be notified in time. In the meantime, the workshops and clubroom are closed in preparation for the August exhibition, and working parties are busy redecorating and cleaning the premises. We anticipate having a good show of models and every endeavour is being made to make the exhibition a success.

All members who have promised models for the exhibition will be notified shortly regarding collection, insurance, etc.

Hon. Secretary: JAMES H. FARR, Wardie Garage, Ferry Road West, Edinburgh, 5.

Salisbury and District Model Engineer Society

The second annual Model Engineering Exhibition will be held in the Guildhall, Salisbury, on Saturday, July 23rd, from 10 a.m. to 9 p.m.

The official opening ceremony at 10.15 a.m. will be performed by Lieut. Cmdr. R. J. H. Duffay, M.B.E., M.I.Mar.E., R.N. (retd.).

In the Guildhall Square there will be a miniature railway on which, at a small charge, children may ride behind a magnificent 5 in. gauge L.M.S. "Royal Scot" locomotive built, loaned and operated by Mr. C. S. Barnett of the Andover M.E. Society

Hon. Secretary and Treasurer: R. A. READ, 7, De Vaux Place, Salisbury.

Glasgow Society of Model Engineers

The final meetings of the Power Boat Section will take place at Maxwell Park, Glasgow, S.1, as indicated below:—

August 27th. Nomination Competition. 3 p.m.

Sept. 3rd. Closing Rally. 3 p.m.

The annual general meeting will be held in the rooms at 60, Clarendon Street, Glasgow, N.W., on Saturday, September 10th, 1949, at 7.30 p.m. It is earlier than usual in view of the exhibition to be held within the Engineering Centre, 351, Sauchiehall Street, Glasgow, C.2, from October 1st for ten days.

Visitors will be welcomed and particulars of membership can be had from the address below.

Secretary: JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

NOTICES

All rights in this issue of "The Model Engineer" are strictly reserved. No part of the contents may be reproduced in any form without the permission of Percival Marshall & Co. Ltd.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. **All such correspondence should be addressed to the Editor (and not to individuals)** at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.